APRIL, 1960

Plant Engineering

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Trying to cope with the daily grind at this Southern fire-brick plant proved too much for the lug-type chain conveyor feeding the big grinder. The bricks, themselves, were murderously abrasive—worse still, they constantly shifted as the belt stopped and started. That meant frequent breakdowns, costly repairs—and a complete chain replacement about every nine months. What can we do about all the down time and upkeep, they finally asked the G.T.M.—Goodyear Technical Man. His recommendation: rugged Stacker conveyor belting. The result: Costly repair jobs have been eliminated. The firm is getting a full year's service from each of the G.T.M.'s belts. And all this from belting costing them 90% less than anything they'd used before.

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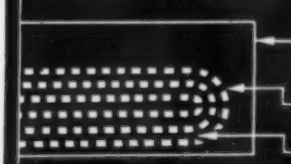

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'ROUND ABOUT

with the editors in field and office

Edited by R. L. Marinello

Asbestos Isn't That Expensive!

IN OUR NOVEMBER issue, on page 125, we published Part 5 of the series of articles on Construction Cost Estimating. In it prices were quoted for the erection of asbestos siding. Several interested parties called our attention to discrepancies in some of the prices listed in Table I. As a result, we checked with the author and a revised set of figures is presented on page 139 of this issue.

We have reprinted the complete page with the necessary revisions so that you can cut it out and use it in place of the one you now have in your set.

Naturally, the revised figures will appear in the complete reprint of this series. In fact, we hope to send the reprint order to the printers soon. If you haven't already placed your order for a reprint, you can do so now by indicating "Construction Cost Estimating" on the post card in this issue or by writing to the Editor, PLANT ENGINEERING, 308 E. James St., Barrington, Illinois. The price for the 32-page reprint will be $1.50.

Engineering Changes at Birge

Norman D. Davern has been named superintendent of maintenance of The Birge Company, Inc., Buffalo, New York. He has been associated with the company for 15 years and previously held the position of general maintenance foreman.

He replaces **William Benning,** former superintendent of maintenance, who recently retired. Mr. Benning was associated with the company for more than 32 years. He spent the last five years on special assignment in the research and development department where he assisted in developing new methods for the manufacture of Birge wallpaper and wall coverings.

Isotope Bibliography

IF YOU WANT to know all about isotopes, you will find this handy reference to articles, reports and various documents helpful.

This 51-page publication lists more than 300 informational references and their availability. The reference listings are broken down into 14 major areas of interest: general publications, basic texts, procurement of radioisotopes, properties, isotope uses, irradiation services, laboratories and equipment, radiation safety, waste disposal, legislation, stable isotopes, development and assistance programs, educational material and lists of users plus market data.

This booklet, Special Sources of Information on Isotopes (TID-4563), is available without charge from the Office of Isotopes Development, U.S. Atomic Energy Commission, Washington 25, D. C.

Engineering Appointments at Owens-Corning Fiberglas Corp.

R. S. Grant

Richard S. Grant has been appointed chief engineer of the Eastern Division of the Owens-Corning Fiberglas Corporation, Toledo, Ohio.

He has been with the company since 1946, holding positions as production engineering supervisor and plant engineer at the company's Kansas City, Kan., plant and facilities engineer for General Products plants since March, 1958.

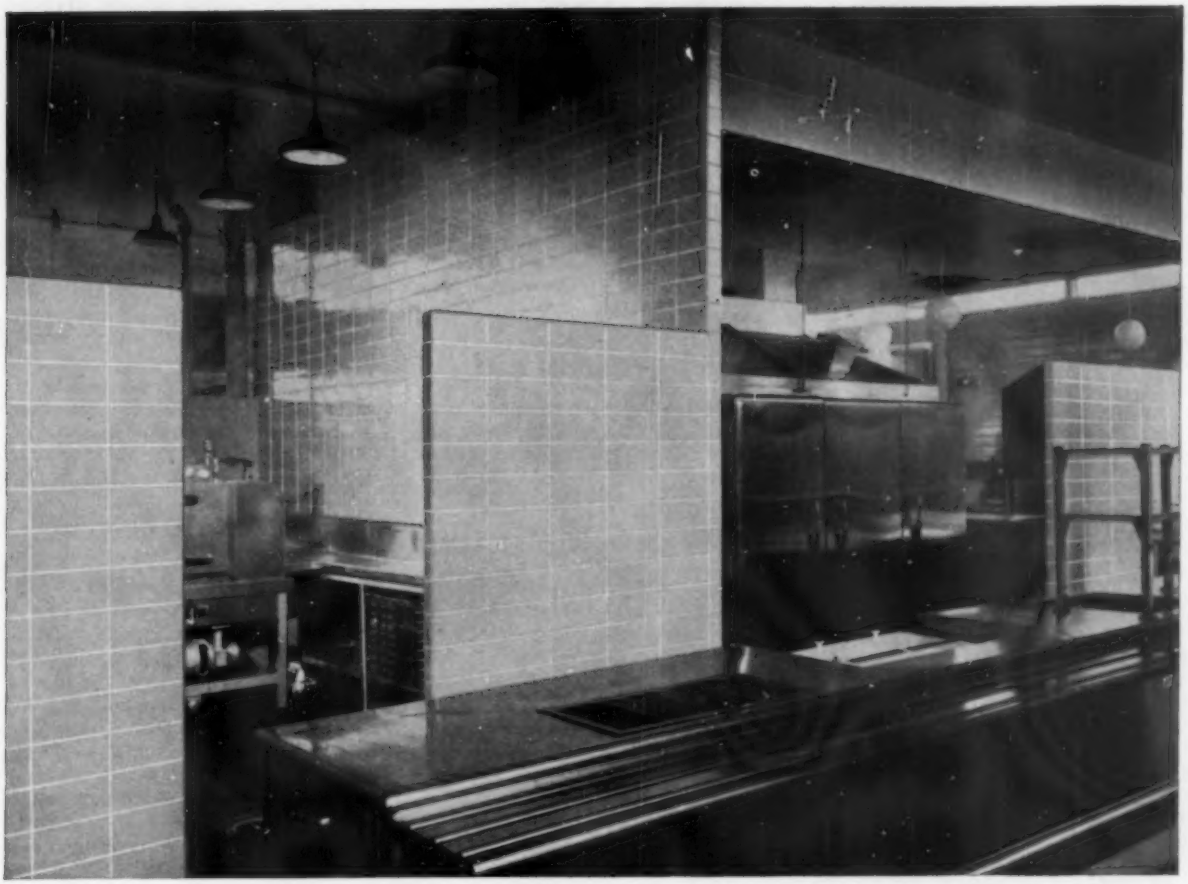
He is a member of the American Institute of Plant Engineers, National Society of Professional Engineers and is a registered professional engineer in Kansas and Missouri.

Other engineering appointments announced were: J. R. Thumm, general products process equipment engineer, with offices in Toledo; H. O. Youngquist, buildings and utilities engineer, with headquarters in Toledo; and R. P. Witschen, construction engineer, with offices in Toledo. All report to Mr. Grant.

Thumm joined the company in 1940 and has served as plant engineering manager, process control manager and product development manager in Newark.

Youngquist joined the company in 1946 and has served at Newark as

Subscriptions: U.S.A. $10, Canada $11. Other countries $12 per year. Single copies $1. Change of address: Send to PLANT ENGINEERING, Circulation Division, Barrington, Illinois. Please supply position title, company name, company address. Request must reach us by the 15th of month to make the change effective with following month's issue. Published monthly and accepted as controlled circulation publication at Chicago, Ill.



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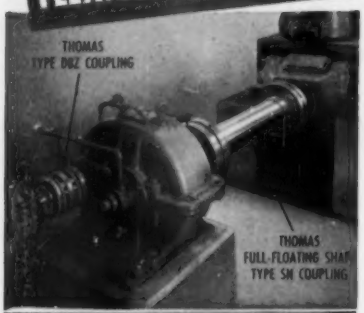

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'ROUND ABOUT

manager of the production engineering department, as plant engineer and in other major assignments.

Witschen joined the company in 1946 and has held engineering assignments in the company's Kansas City and Newark plants and served as plant engineer at the Barrington, New Jersey facility.

Retirement—Promotions at GM

R. B. Hadley has been named plant engineer and **C. J. Karrer** master mechanic at the Detroit Diesel Engine Division of General Motors. Hadley and Karrer jointly assume the assignment formerly handled by **L. K. Rosenberg** who is retiring after serving with the company for 17 years.

Rosenberg came to the company in 1943 as supervisor of process engineering. He became assistant master mechanic in 1945 and in 1950 was promoted to assistant works manager. He was formerly associated with the Yellow Truck and Coach Company.

Both Hadley and Karrer are graduates of General Motors Institute. Hadley graduated in 1949 with a degree in industrial engineering. Karrer received his Bachelor of Science degree in 1948 and a Master of Science degree from Massachusetts Institute of Technology in 1959.

Plant Engineering Magazine Sponsors Lighting Research

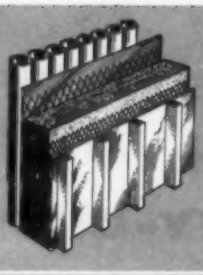
BASIC, NON-COMMERCIAL research of scientific calibre essential to the continued progress of lighting and illumination gained a new sponsor when PLANT ENGINEERING signed up as a sustaining member of the Illuminating Engineering Society Research Institute. It is the first technical trade publication to sponsor this important work.

The Illuminating Engineer Research Institute was organized in 1944 to conduct and stimulate research in illuminating engineering and related fields. An independent body sponsored by the Illuminating Engineering Society, it is directed by a Board of Trustees having sole authority over disposition of funds.

Thirteen research projects are presently under way and a total of 44 projects have been completed during the Institute's 15 years of operation. The over-all program is designed to find answers to problems suggested by technical committees of the Illuminating Engineering Society and by everyday lighting practices.

Alert to methods that will best serve its readers, PLANT ENGINEERING is cooperating in this research venture as a means of finding information that will help plant engineers everywhere. Modern industrial plants require increasing quantities of high quality illumination for high production operations. Basic research is expected to supply the answers to means of securing these high illumination levels without sacrificing the comfort or economy of operation associated with present lighting techniques.

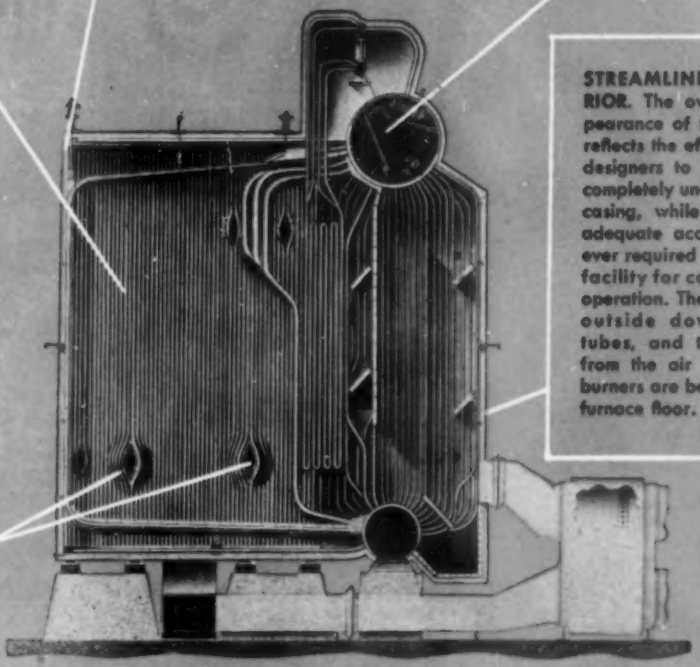
Arthur L. Rice, Jr., Executive Vice President of Technical Publishing Company, left, presents check to John J. McLaughlin, Vice President, Kelso Burnett Electric Co., and member of the Board of Managers, Chicago Section of the IES, as Thomas E. Hanson, right, Editor, Plant Engineering, witnesses transaction.



PRESSURE-TIGHT, SKIN CASING. A service-proved method of casing construction for pressure-fired boilers in the size class of the VU-55, this casing is designed to assure lifetime tightness with minimum heat loss. Pressure firing permits the elimination of an induced draft fan with its attendant operating and maintenance costs. Wall construction consists of tangent tubes backed up successively with welded steel panels, 4 inches of high quality insulating material and an outer steel casing formed as shown to provide adequately for expansion and to give a neat, finished appearance.

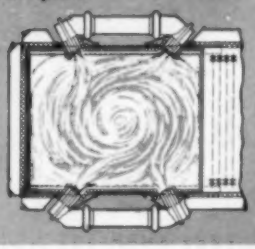
HIGH STEAM QUALITY. The VU-55 has generous water capacity and steam reservoir space. Its drum internals are exceptionally effective in producing high quality steam at all ratings.

TANGENT FURNACE TUBES. The VU-55's furnace tube arrangement provides complete heat-absorbing, water-cooled protection on all furnace walls. Furnace maintenance is minimized, refractory expense is eliminated.



STREAMLINED EXTERIOR. The over-all appearance of the VU-55 reflects the efforts of its designers to achieve a completely unobstructed casing, while retaining adequate access wherever required and every facility for convenient operation. There are no outside downcomer tubes, and the ducts from the air heater to burners are beneath the furnace floor.

TANGENTIAL FIRING. More than 20 years of application experience have established the exceptional advantages of tangential firing. About 90 percent of Combustion's large utility installations use this advanced method of firing. Flame streams from the four burners impinge upon one another at high velocity, as shown, creating a turbulence unattainable by any other method of firing. The result is rapid and complete combustion. As the gases spiral upward, they sweep all furnace heating surfaces, assuring a high rate of heat absorption.



The VU-55 Boiler...

a "standardized" boiler with "custom-built" performance

The C-E Vertical-Unit Boiler, Type VU-55, is designed to bring central station type of performance to the "standardized" boiler market.

It combines a number of time-tested and service-proved features such as Tangential Burners, pressure-tight casing and tangent furnace tubes. This bottom-supported unit requires no outside supporting steel, is economical of space and has an uncluttered, streamlined appearance.

The VU-55 is available in a series of sizes ranging in capacity from 70,000 to 150,000 lb of steam per hour. It is designed for three pressure ranges (250,500 and 750 psi) and can be equipped with a superheater to provide temperatures up to 800 F.

The VU-55 Boiler is symmetrical in design, performs efficiently over a wide range of output, and is easy to operate and maintain.

When you are considering additional steam capacity in the quantity range mentioned above don't fail to consider the VU-55.

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"Q" Factor* Features Available Only in Buffalo Designs

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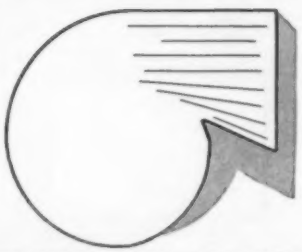

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See why Pittsburgh Corning Products make the things you build cost less, last longer, look better

example: PC Glass Block Panels bring four important benefits to Electric Boat

Even density lighting, good atmospheric control, attractive appearance and minimum maintenance. These benefits have proved the soundness of the decision by Electric Boat Company, Division of General Dynamics, to use PC Glass Blocks for new panels and sash replacement at their Groton, Conn., plant. Attractive on the outside, the Glass Block panels have virtually eliminated morning glare and afternoon shadow in laboratories and working areas.

The excellent insulating value of the blocks makes it far easier to insure accurate, pressurized atmospheric control within the building. Maintenance has been negligible . . . with nothing to rust, rot or need painting . . . and not a single instance of breakage or structural failure in the glass block panels.

This kind of experience makes PC Glass Block panels the odds-on favorite to eliminate window problems in virtually any type of industrial plant or commercial building.

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PITTSBURGH PC CORNING

example: FOAMGLAS® insulation to keep heat in its place

Most roof insulations do an adequate—or better—job of controlling heat flow when they're first installed. But not many maintain their initial level of performance beyond a period of surprisingly few months. FOAMGLAS is one of that select few. The reason is simple. FOAMGLAS is the only thermal insulation composed entirely of sealed glass cells. Result: moisture can never penetrate FOAMGLAS to condense and form a heat leak as it does in other materials. Insulating performance never varies. Here you see one of the many excellent reasons for a FOAMGLAS specification on a roof . . . as well as walls or piping —wherever heat flow must be controlled.

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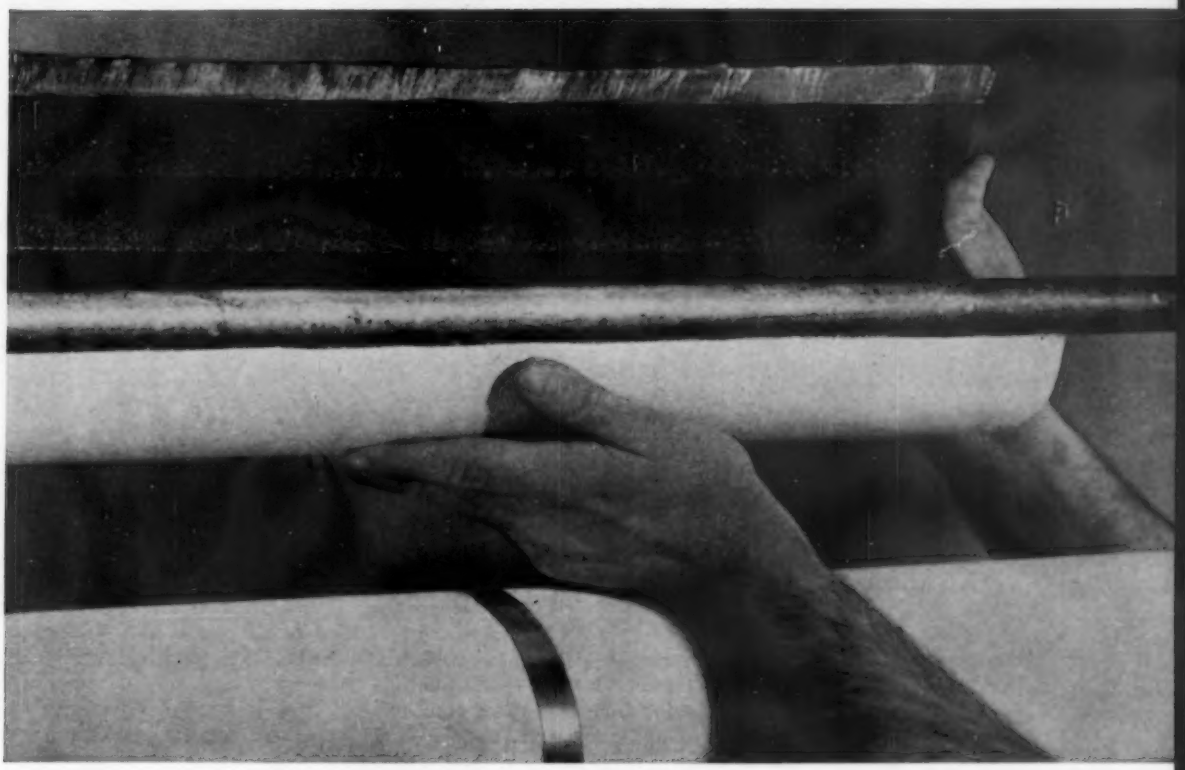
PITTSBURGH

example: top quality, low cost with the new FOAMGLAS® STAY-DRY Pipe Insulation



Pictured here is a way you can avoid sacrificing insulation quality for cost on heating-cooling lines from +35° to +350°F. It's Pittsburgh Corning's new FOAMGLAS STAY-DRY Pipe Insulation . . . at a cost comparable with other insulations used for commercial lines.

Only FOAMGLAS STAY-DRY Pipe Insulation gives you so many benefits. Sealed glass cells insure constant insulating value, eliminate extra moisture seals or vapor cut-offs. Easy to cut and shape. Standard 24″ lengths with kraft-foil jacket. It is available in 1″ and 1½″ nominal thicknesses for all lines from ½″ copper tubing through 6″ I.P.S. Its high strength prevents insulation sag on vertical piping.

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PC CORNING

example: FOAMSIL®, the new acid-proof insulating refractory for use from −450°F to +2200°F continuous

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Please send me descriptive literature on the products checked below.

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- ☐ FOAMGLAS Low Temperature Insulation
- ☐ FOAMGLAS Insulation for Industrial Piping
- ☐ FOAMGLAS STAY-DRY Pipe Insulation
- ☐ FOAMGLAS Insulation for Curtain Wall Panels
- ☐ PC GLASS BLOCKS
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- ☐ FOAMSIL®, the Acid-proof Insulating Refractory

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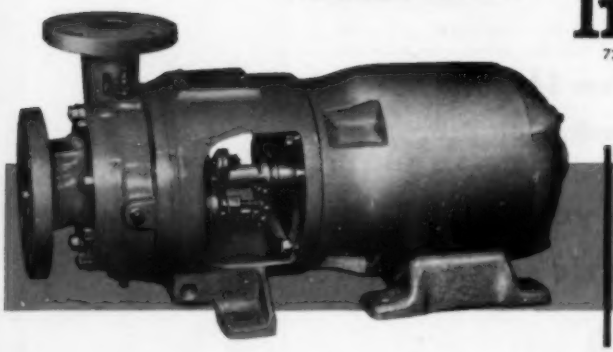

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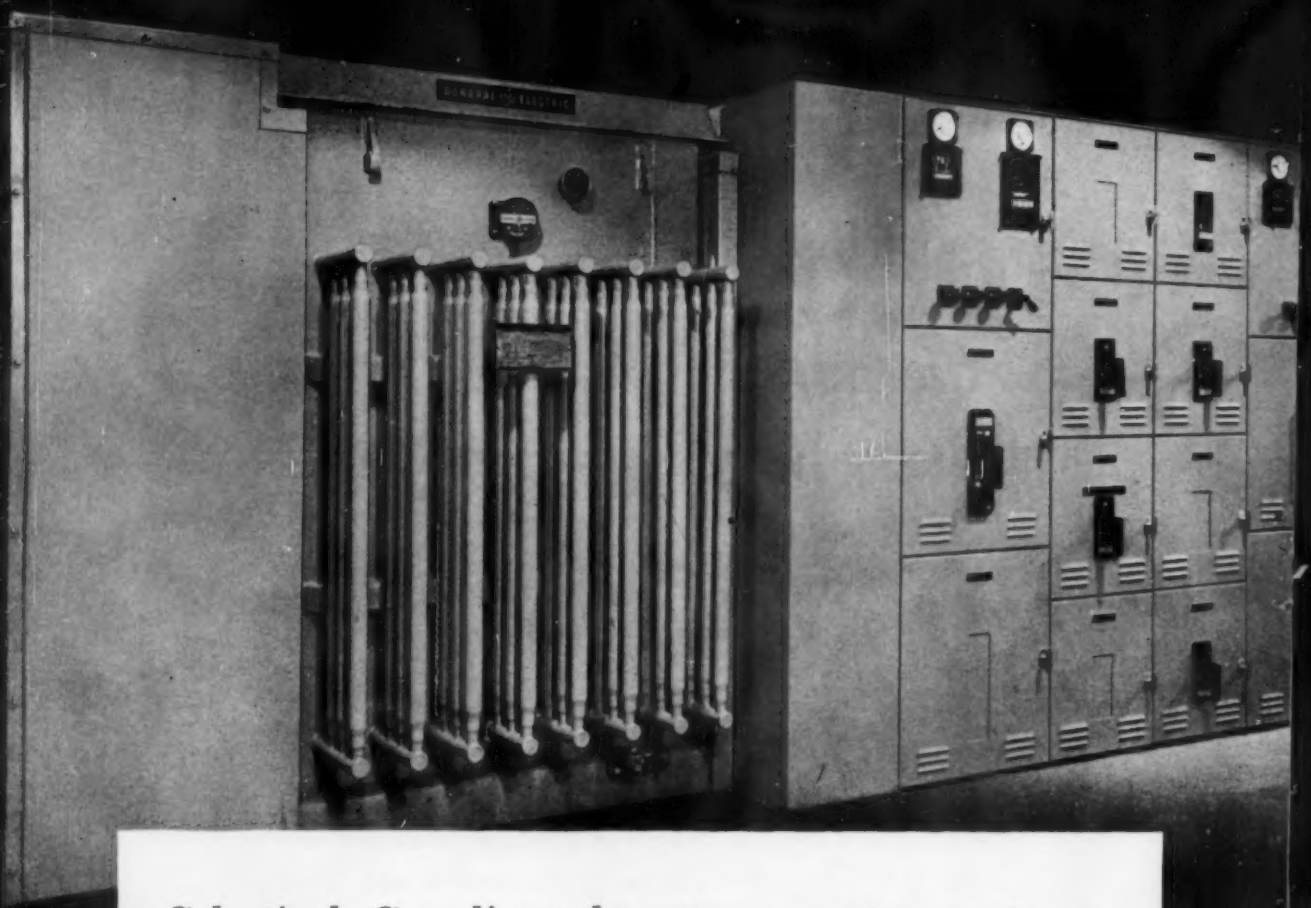

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Total savings vary from $465 to $930 per breaker, depending on size.

How much can you save? Ask your General Electric sales engineer.

General Electric *Selectively Coordinated* Load Center Unit Substations now are . . .

Yours at Lower Cost

YOU NOW PAY LESS

You can purchase G-E *Selectively Coordinated* load center unit substations at new low prices. General Electric has eliminated the price premium normally charged for this inherently higher-cost, more highly-engineered product. This means that you can now get superior service for the same price as the more common, but less "intelligent," fully-rated load center unit substation. Further savings can be realized by the use of manually operated stored-energy breakers.

SELECTIVELY COORDINATED LOAD CENTERS MINIMIZE DOWNTIME

In the *Selectively Coordinated* load center, the tripping times of the main and feeder breakers are coordinated so that during short-circuit conditions, power is removed only from the faulted feeder. Power continues to flow to the unfaulted feeders—thus preventing costly, unnecessary downtime. (See diagram below.)

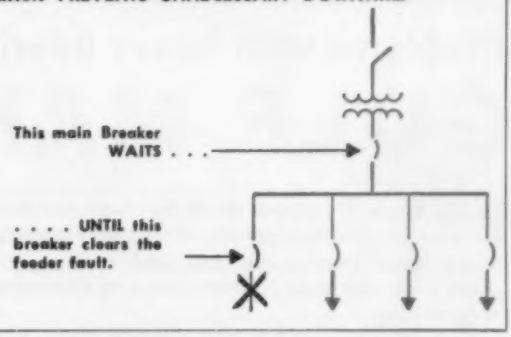
SIMPLY SPECIFY SELECTIVE COORDINATION

Order the *Selectively Coordinated* load center. Upon delivery, you will receive time-coordination curves which show you the factory-preset characteristics of each breaker, how they combine to assure you of the best possible service continuity.

For more detailed information, contact your nearest G-E Apparatus Sales Office or write to General Electric Co., Schenectady 5, N. Y. for bulletin GEA-3592. 531-01

HOW Selective Coordination PREVENTS UNNECESSARY DOWNTIME

WITH G-E SELECTIVELY COORDINATED load center unit substations, feeder breakers are adjusted to clear any magnitude of feeder fault. The selective main breaker preserves power continuity to unfaulted feeders.



Progress Is Our Most Important Product

GENERAL ELECTRIC

For more facts circle 509 on Reply Card

Problems with heavy bearing and gear loads? Let Gulfcrown®

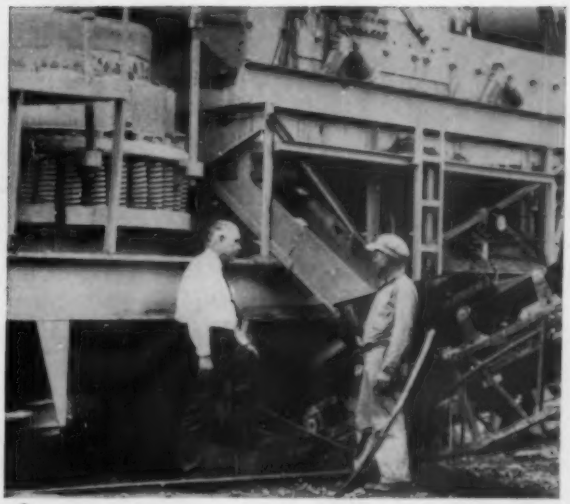
GULF MAKES THINGS

Here's the multi-purpose grease for tough service. It's a superior, lithium-base grease specially developed for use where heavy bearing and gear loads exist . . . where shock loads may occur . . . where machine element action is oscillating.

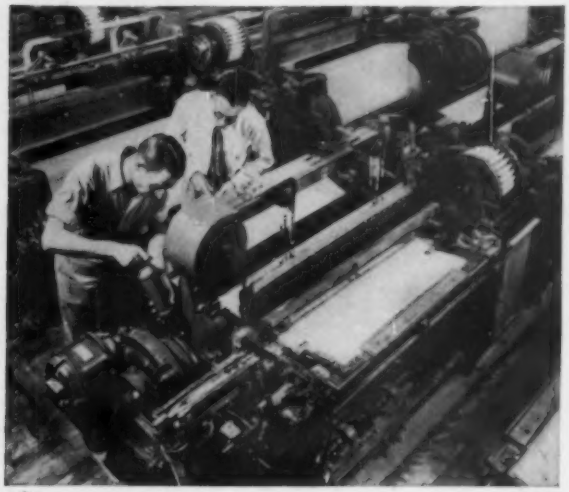
Gulfcrown Grease E.P. will give you plenty of proof that Gulf makes things run better. It resists heat, cold, moisture and mechanical breakdown. It has excellent oxidation stability and protects against corrosion.

You'll find that this grease pumps freely at zero, yet stands up at temperatures to 250°F., and even higher under certain conditions.

Gulfcrown Grease E.P. is an unusually versatile multi-purpose grease. For example, it gives excellent results in the lubrication of heavily loaded trunnion bearings . . . steel mill work rolls and table rolls . . . sliding dog clutches . . . spiral gear boxes . . . Banbury mixers . . . the bearings, cams and gears in textile looms . . . and a great



In hard-working equipment, like stone crushers, Gulfcrown Grease E.P. withstands extremely high shock loads in grease lubricated bearings.



In textile mills, the excellent oxidation stability of Gulfcrown Grease E.P. makes it the ideal lubricant for loom bearings, cams, pick balls and gears.

In steel mills, Gulfcrown Grease E.P. will successfully withstand the high temperatures and extreme pressures encountered in the lubrication of work rolls and table rolls.

Grease E.P. prove that

RUN BETTER!

number of other heavy-duty industrial applications.

Gulfcrown E.P. can be used for electric motor bearings, fans, pumps and for nearly every type of application. Can be applied through centralized systems or by gun. Available in NLGI consistencies 0, 1 and 2.

Find out how Gulfcrown Grease E.P. can improve your operation and help you get lower maintenance costs. Call your Gulf Sales Representative at the nearest Gulf office. Meanwhile, mail coupon for booklet.

GULF

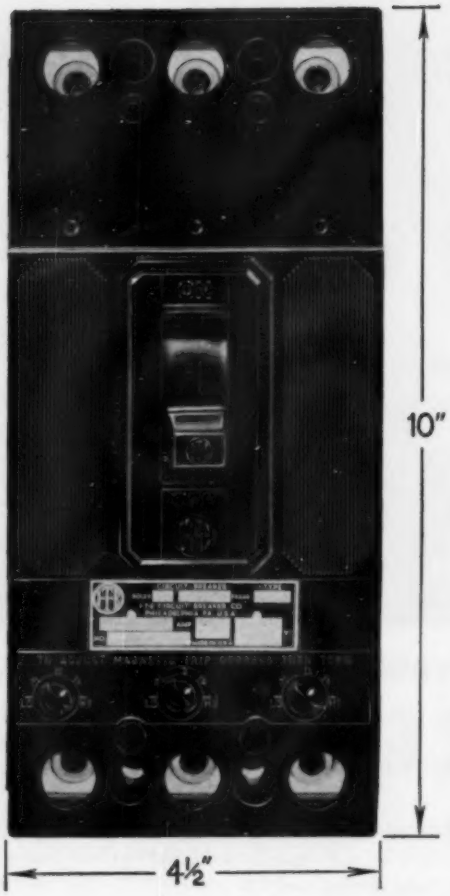
GULF OIL CORPORATION
Dept. DM, Gulf Bldg., Pittsburgh 30, Pa.

Please send booklet on
Gulfcrown Grease E.P.

Name_____
Title_____
Company_____
Address_____
City_____ Zone____ State_____

For more facts circle 510 on Reply Card

LOOK, EVERYBODY,
NOW I'M
54% SMALLER



225 amp breaker in new FJ frame size. 70 to 225 amp continuous at 600 v, 2 or 3 poles. Interrupts 25,000 amp at 240 v, 15,000 amp at 600 v. Instantaneous trip adjustable externally.

Get all the details. Write today to I-T-E Circuit Breaker Company, Dept. SA, 1900 Hamilton St., Philadelphia 30, Pa.

I-T-E CIRCUIT BREAKER COMPANY

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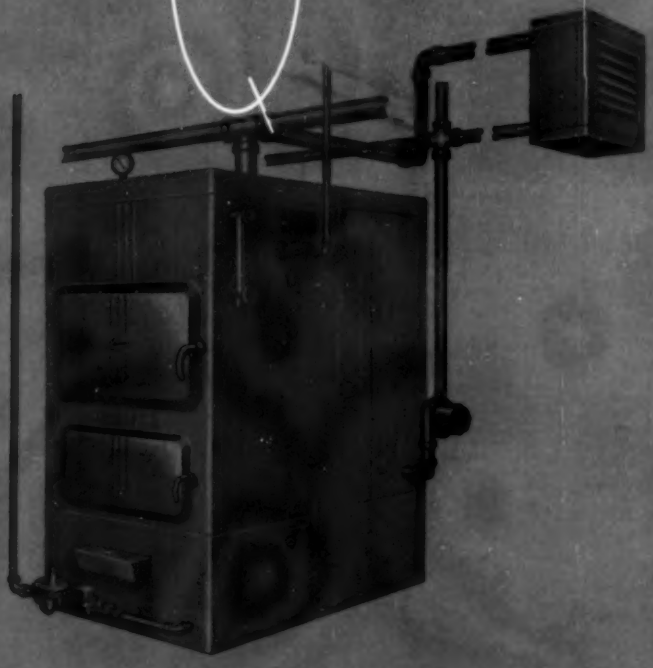
is there really a question?



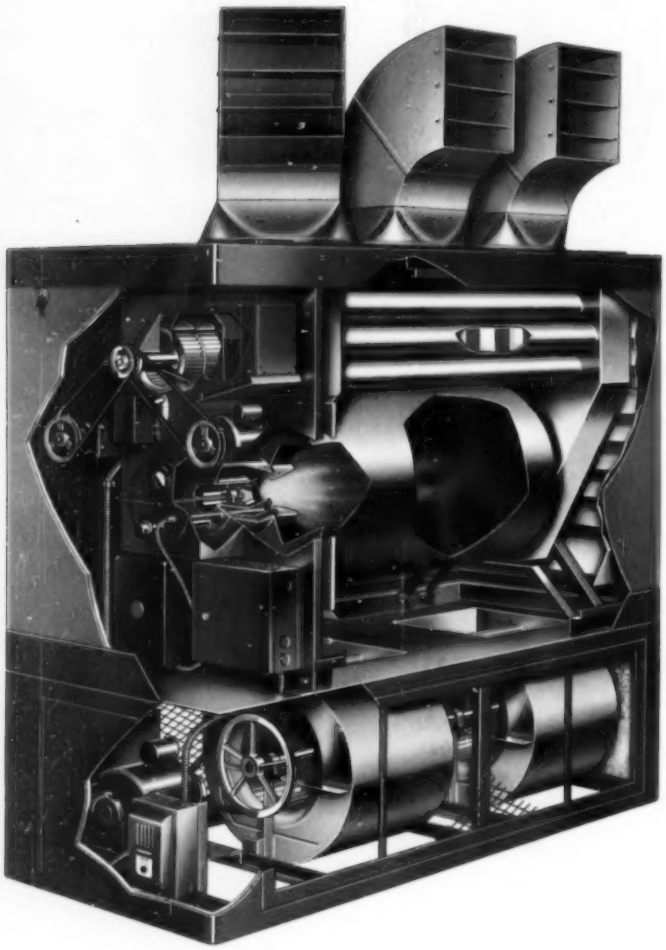
* what is the most economical way to heat an industrial or commercial building?

* direct-fired vs "wet" industrial heating

- heating and air conditioning
- make-up air and ventilation
- process work
- space heating

LENNOX

LENNOX direct-fired space heater



Integrated Burner Design

Designed specifically for the "OG" for gas, oil or combination fuels.

Heat Exchanger

Meets Underwriters' requirements when subjected to 180° F. rise over stainless steel primary and aluminized secondary surfaces. No internal baffles.

Single Motor Operation

One motor operates fuel unit when required, also induced draft blower and combustion air blower.

Quiet Running Blowers

Moves huge volumes of air at office-quiet sound levels. Blower motor mounted on adjustable slide rails. Because of blower size, units are adaptable to air conditioning.

Combustion and Induced Draft Blowers

Blowers mounted on a common shaft . . . driven by a single motor. All combustion air is preheated.

Master Programmer Controls

Enclosed to prevent tampering or damage. Fireye standard on oil units. Stack control optional on oil units.

EFFICIENT HEAT TRANSFER DESIGN RESULTS IN MINIMUM PHYSICAL SIZE . . . MAY ALSO BE INSTALLED HORIZONTALLY OR SUSPENDED FROM THE CEILING

Where floor space is at a premium, a suspended horizontal or inverted unit is quite often the answer. Used with optional service platform, this unit is serviced easily, and takes up very little ceiling area.

For ventilating, as well as heating, automatic fresh air dampers can be attached along with filter sections.

With the addition of ducts, it is ideally suited for central heating applications at static pressures up to 2″. Because of the simplicity of installation, costs are kept at a minimum.

Compact design and trouble-free operation continue to bring you low cost heating and maintenance . . . which is typical of all Lennox industrial installations.

LENNOX Industries Inc.

MARSHALLTOWN, IOWA • COLUMBUS, OHIO • SYRACUSE, N.Y. • FORT WORTH, TEXAS • LOS ANGELES, CALIF. • SALT LAKE CITY, UTAH
DES MOINES, IOWA • DECATUR, GEORGIA • LENNOX INDUSTRIES (CANADA) LTD., TORONTO, ONTARIO • CALGARY, ALBERTA

LITHO U. S. A.

FORM NO. IND.-601-M2

New Nalco Coagulant makes Larger, Heavier Floc . . . Faster

Radically different Nalcolyte 110 used with Conventional Chemicals to Cut Costs, Speed Action in Water Clarification

Photo taken in Nalco Laboratories 7 seconds after agitation stopped: *Left*, Control sample of untreated turbid water; *center*, same water, treated with 50 ppm alum; *right*, same water, treated with 20 ppm alum, 1 ppm Nalcolyte 110. Note that large, dense floc is settling out much more rapidly than center alum-treated sample.

Nalcolyte 110 is a new, non-ionic high polymer flocculant of very high molecular weight—over 1,000,000. It is used in extremely small dosages with conventional coagulants (such as sodium aluminate, alum, ferric sulfate) to increase size, density and uniformity of floc.

Less Chemical; Greater Capacity

Action of Nalcolyte 110 in creating heavier, larger, faster-settling floc not only permits greater throughput rates without floc carryover to processing equipment, but also cuts the total chemical requirements at a resultant cost saving.

In the example illustrated above, only 40% as much alum is required when Nalcolyte 110 is used.

May be Used in Potable Waters

Approved by the U. S. Public Health Service Technical Advisory Committee for use in treatment of public water supplies, Nalcolyte 110 gives water works the opportunity to get appreciably greater capacity from existing clarification equipment—at lower treating cost.

High Suspended Solids No Problem

Waters containing high suspended solids respond quickly to Nalcolyte 110 coagulating action . . . frequently without other coagulant chemicals.

Typical high suspended solids waters which can be treated with speed and economy with Nalcolyte 110 are paper mill white water systems, industrial waste waters, mineral slurries and blast furnace gas wash water slurries.

Nalcolyte 110 Easy to Handle

Nalcolyte 110 is a coarse, white, free-flowing powder of non-toxic character. It is fed in dilute water solutions with standard liquid proportioning pumps or feeders. Stock solutions are prepared at concentrations up to 20%. Packaging is in convenient 25-lb. bags.

Data Available Promptly

Full information on Nalcolyte 110 for your coagulant use is ready to be sent upon your request. Write today, or call your Nalco Representative.

National Aluminate Corporation is now

NALCO CHEMICAL COMPANY

6217 West 66th Place • Chicago 38, Illinois

Subsidiaries in England, Italy, Mexico, Spain, Venezuela and West Germany
In Canada—Alchem Limited, Burlington, Ontario

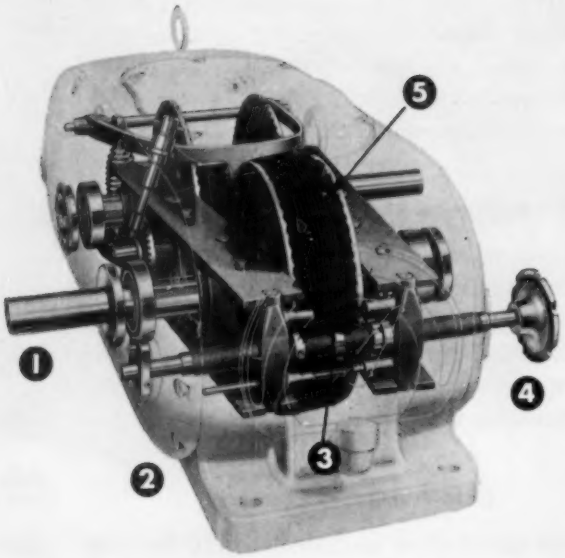
nalco®

. . . Serving Industry through Practical Applied Science

Nalco CHEMICALS

For more facts circle 513 on Reply Card

PUT TEETH IN YOUR SPEED CHANGING JOBS



Get the positive, accurate control that only LINK-BELT's chain-driven P.I.V. can deliver

Yes, you put teeth into your speed changing jobs because Link-Belt P.I.V.—unlike other variable speed drives—utilizes an exclusive metal, self-tooth-forming chain.

Here's how it works! P.I.V. chain consists of a series of overlapping steel links. The links contain packs of slats which are free to move from side to side, singly or collectively, to serve as teeth. The chain meshes with radially grooved wheels, which are cut to a constant depth towards the wheel periphery. Beveled sides of the grooves offer gripping areas . . . provide a positive, nonslip contact at any speed, under all loads.

Makes changing speed simple too! A turn of the control screw simultaneously varies the effective diameters of the conically shaped wheels—closing one set, spreading the other. At the same time, the self-tooth-forming chain automatically adjusts to provide desired ratio between the input and output shafts.

BOOK 2274—Your Link-Belt office or authorized stock-carrying distributor has Book 2274 on P.I.V. drives from ½ to 25 hp. Refer to the yellow pages of your local phone directory under Power Transmission Equipment.

(1) You can get minute speed changes and maintain them accurately while operating under full load.

(2) All-metal, totally enclosed—unaffected by atmospheric conditions. All vital operating parts splash-lubricated from a common housing reservoir.

(3) Easy-view speed indicator facilitates speed selection and adjustments to meet all requirements.

(4) An infinite number of positive, stepless speed adjustments may be made with manual, electric, pneumatic or hydraulic controls.

(5) Self-tooth-forming chain is made from a series of overlapping steel links. Links contain packs of hardened steel laminations or slats (shown above). Slats grip toothed wheels positively without slippage —give the speed you need at any setting.

15,240

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To serve Industry There Are Link-Belt Plants, Sales Offices and Stock Carrying Distributors in All Principal Cities. Export Office, New York 7; Australia, Marrickville (Sydney); Brazil, Sao Paulo; Canada, Scarboro (Toronto 13); South Africa, Springs. Representatives Throughout the World.

LINK-BELT

P.I.V. VARIABLE SPEED DRIVE

For more facts circle 514 on Reply Card

BULLETINS just released and of immediate plant interest

VENTILATION

101 For Controlled Ventilation—This 20-pp catalog is designed as a guide for better air control to help plant engineers determine exact type ventilation equipment best suited for specific needs. Guide matches design features with ventilation requirements and special conditions, controlling efficiency, and economy and lengthening life of unit. Includes performance and dimension charts. The Loren Cook Co.

102 Round Power Ventilators—Bulletin RPV-1 describes features and advantages of round power ventilators combining unrestricted air passage with complete weather protection. Construction details are illustrated; dimensions and capacities tabulated. Bowman Steel Corp.

103 Roof Exhausters—Engineering information on Key Line axial power roof exhausters is contained in Bulletin 60-AK. In this exhauster design, motor and drive assembly are in a separate housing parallel to blade; this removes motor from air stream and reduces overall height. Bulletin lists air moving capacities for 71 axial models under static pressures from 0 to ¾ in. Includes dimensional and curb cap drawings, electrical characteristics, data on accessories. Jenn-Air Products Co., Inc.

104 High Velocity Units—Catalog HV-70 contains 24 pp of application and performance information on a line of high velocity air distribution systems. Includes dimension drawings and tables as well as cfm capacity, static pressure and radius of diffusion rating. Anemostat Corp. of America.

DUST CONTROL

105 Freedom from Dust—Bulletin 805, 28 pp, describes a variety of dry collection equipment, showing ways of using cloth filtration and cyclonic equipment for eliminating dust control and air pollution problems. Features descriptive information and specifications on the Multi-Bag filter, Uni-Filter, Glass-Bag Filter and Whirl-Clone, also special collectors and accessories. Illustrated application data shows how industry uses these to collect waste dust or reclaim valuable reusable material. Dracco Div., Fuller Co.

106 Dust Collectors—Included in 16-pp Bulletin 1828 is a list of typical industry dust control applications... for power plants, steel production, cement and aggregate production, chemical and petroleum processing, food and grain processing and general manufacturing. Covers operating characteristics, construction features, and includes nomogram presentations designed to simplify engineering calculations, assembly arrangements, line drawings, dimensional and physical data. American-Standard.

Postage-free Reader Service Cards make it easy to order bulletins. Cards are provided on pages 275 and 276.

MATERIALS HANDLING

107 Load Handling Equipment—Illustrated and described in 20-pp Bulletin 15025 are hoisting products for overhead load handling. Included are descriptions of electric hoists, air hoists, chain blocks and hoist accessories, lever operated hoists, chain blocks, electric and air operated cable type hoists, and lifting specialties. Manning, Maxwell & Moore, Inc.

108 Screw Conveyors—Comprehensive information on applications and selection of screw conveyors, screw feeders, and components is presented in 78-pp Book 2989. Contains descriptive sections on screw conveyors and their uses, types of components, engineering of screw conveyors, screw feeders, components, dimensional data, and lists materials for which conveyors may be used. Link-Belt Co.

109 For Bulk Materials—Six-pp Folder 2721 describes Jetslingers—machines equipped with short, high-speed belt conveyors for hurling free-flowing bulk materials into areas inaccessible by other mechanical means. Illustrates and describes suspended, swiveling and wheel-mounted units for hurling material into storage in warehouses, boxcars, holds of ships, bins or the ground. Link-Belt Co.

110 Overhead Traveling Cranes—Operation and design features of overhead traveling cranes for a variety of applications in industry are given in 12-pp Bulletin 6-B. Crane components are illustrated, four basic types of cranes are described, and sizes shown. Abell-Howe Co.

111 Utility Tractors—Twelve-pp Catalog UT-111 covers utility tractors with matched equipment to enhance their versatility. Points up numerous advantages—low profile, high clearance, short turning, easy riding, also economy of operation. Photos show uses. Allis-Chalmers Mfg. Co.

112 Car Shaker—Advantages of a 3½-ton car shaker for fast, safe, economical, pushbutton unloading of granular material from open, hopper-bottom gondola cars, are given in Bulletin 26B9438. This shaker is designed for plants where unloading of hopper-bottom cars does not warrant installation of a 5-ton unit and where smaller capital investment is desirable. Allis-Chalmers Mfg. Co.

STORAGE EQUIPMENT

113 Storage Rack System—Eight-pp Catalog 107 describes a flexible storage rack system which has only two basic parts and can be assembled without tools, bolts or nuts. Includes complete tabulations of basic parts. Bernard Gloekler North East Co.

114 Slotted Angle—Twelve-pp catalog 180 illustrates and describes applications of company's slotted angle for stacking, racking, framing, machine guards, pipe mountings, pallet storage, partitions, bulk storage, and other uses. Construction details and load capacity tables included. Lyon Metal Products, Inc.

115 Storage Racks—Illustrated and described in this product bulletin are storage racks made of high carbon rail steel, featuring a positive-locking device for fast assembly and adjustability. Design and construction features are detailed and dimensional data included. Met-Fab Inc.

116 For Plant Libraries—Ten-pp Bulletin 1593, illustrated in color, shows installations of library shelving book stacks and accessories combining functional design with a choice of colors. Illustrates styles available, construction features and includes ordering tips. Deluxe Metal Products Co., Div., Royal Metal Mfg. Co.

CONSTRUCTION

117 Architectural Aluminum—Featured in this 12-pp bulletin is a line of architectural aluminum products, including doors, door frames, door hardware, sash, sill, bead, awning flaps, division bars, framing members and curtain walls. Complete specifications given. The Alumiline Corp.

118 Panel Wall Materials—Eight-pp Booklet B-7871, illustrated in color, covers characteristics, applications, and installation of Micarta-surfaced panel wall materials. Provides a working knowledge of uses and properties of the 16-by-96 in. panels on which a decorative high-pressure plastic laminate is bonded to a fire-resistant compressed cellulose core. Micarta Div., Westinghouse Electric Corp.

119 Masonry Bonding Agent—Form 93, 6-pp, covers Hornbond, a liquid resinous emulsion bonding agent for concrete, plaster, stucco, gypsum, cinder block and tile. Gives data on color, properties, function, method of application, coverage and tests for vibration, acidity and toxicity. A. C. Horn Companies.

120 Rugged Concrete Floor—Advantages of iron-armoured concrete floors are detailed in 24-pp Bulletin MP-4d. Discusses such features as wear and corrosion resistance, economy, spark resistance, static-dissemination, color, and slip-and dusting-resistance. Photos, diagrams cover installation method and typical installations. The Master Builders Co.

121 Fastening with Rivets—Advantages of fastening with rivets are detailed in this 8-pp bulletin. Cross-section diagrams show operation details and charts list complete design and selection data. Pop Rivet Div., United Shoe Machinery Corp.

BULLETINS

(Begins on page 23)

122 Masonry Fasteners—Fifty-pp pocket-size Catalog 160 lists anchors and fasteners for masonry and hollow walls. Covers machine screw anchors, lag screw expansion shields, machine bolt expansion shields, closed back machine bolt expansion shields, masonry drills, and a variety of anchors. Fully illustrated, includes application information, size data. Diamond Expansion Bolt Co., Inc.

123 Screw Fastening of Aluminum—This 48-pp technical handbook covers various types of standard and special fasteners and fastening systems used to join aluminum assemblies. Supplemented with numerous illustrations and tables, it includes list of manufacturers of special screw fasteners and recommended hole sizes for various types of self-tapping screws in sheet aluminum and other materials. Reynolds Metals Co.

124 Plumbing for Concrete Decks—This 12-pp booklet explains in detail how openings can be designed into precast concrete decks and framed during construction, or handcut or drilled after deck is in place. Typical plumbing conditions and methods of providing openings are shown. The Flexicore Co., Inc.

125 Safety Gratings—Illustrated and described in 24-pp Safety Handbook 60 is a line of safety gratings, stair treads, and safety edgings and step bars. Covers advantages and applications of the six types of safety gratings available for every type of industrial need, illustrates installations. Bustin Steel Products Co.

126 Why Rent Piling—Advantages of renting sheet piling are discussed in 24-pp Catalog 400. Illustrates typical installations, and typical pile arrangements for rectangular and circular cofferdams, and includes dimensional data. L. B. Foster Co.

LIGHTING

128 Aluminum Lighting Fixtures—Bulletin 652 describes design, materials and reliability features of company's aluminum, vaportight lighting fixtures. Provides details on labor saving features, technical data, ordering information, prices. The Pyle-National Co.

129 Fluorescent Lighting Ballasts—Featured in 12-pp Bulletin FL-370 are fluorescent lighting ballasts for indoor and outdoor applications. Includes complete selection information, electrical and mechanical specifications. Sola Electric Co.

TOOLS, WELDING

130 Power Tools—Presented in this 64-pp 1960 catalog is manufacturer's line of power tools for industrial production, plant maintenance, construction, wood and metalworking and other uses. Saws and accessories, hammers, planes, routers, sanders, drills, drivers, wrenches, shears, polishers, grinders and abrasive products are included. Catalog is generously illustrated with photos of products, features and applications. Provides specifications, selection information. Skil Corp.

131 Safety Tools—Non-sparking safety hand tools for use wherever inflammable gases, explosives or other hazardous conditions are present are described in 24-pp Bulletin ST-10d. Describes over 400 items for almost every type of hazardous condition. Ampco Metal, Inc.

132 Welded Connections—Detailed information on theory and use of welded connections in building construction is presented in this 68-pp manual for structural welding practice. Includes welding specifications, design tables, table of standard welding symbols, computation data for various types of connections, detail drawings and assembly details. Saxe Welded Connections.

MECHANICAL POWER TRANSMISSION

133 Controlled Speed Systems—Illustrated in color, this 8-pp brochure discusses the Varidyne a-c controlled speed system principle. Shows how Varidyne uses a-c characteristics to provide adjustable speeds by converting fixed-speed a-c motors to adjustable speeds regardless of whether one or several motors are involved, even providing speed coordination and equal load distribution in multimotor installations. Illustrates representative applications. U. S. Electrical Motors Inc.

134 Stock Chains, Sprockets—Listed in 44-pp Book 2757 are stock sizes of this company's roller chains and sprockets available for immediate delivery in major industrial areas. Key indexed for easy reference, book presents 2000 types and sizes including standard and double pitch power transmission chains, conveyor chains and attachments and sprockets. Lists standard roller chains—single, double, triple and quadruple strand—together with heavy series roller chains, corrosion-resistant stainless steel and bronze types. Link-Belt Co.

135 Shaft-Mounted Reducers—Modern methods of speed reduction with compact, shaft mounted units in a wide range of sizes and horsepowers are described in 64-pp Bulletin A692. Construction details, dimensions and installation information are given, illustrated with photos and engineering drawings, as well as tables designed to simplify selection of reducers for various applications, power requirements and speeds. Dodge Mfg. Corp.

136 Speed Reducers—Advantages of design and operation of Slo-Speed gear motors and motor reducers are detailed in 8-pp Bulletin 198. Illustrates and describes basic types and various modifications, as well as mounting positions possible. Sterling Electric Motors, Inc.

Reader Service Cards for ordering bulletins are on pages 275-276. Be sure to include your name, job title, and company, even if you want bulletins mailed to your home address.

137 Magnetic Pulleys—Factors governing selection of electromagnetic pulleys or non-electric ceramic type pulleys are explained in 8-pp Catalog C-2000. Covers applications, and includes detailed chart on selection of pulley in relation to belt speed, belt width, and burden. Dings Magnetic Separator Co.

138 Bearing Units—Illustrated and described in 20-pp Bulletin Bu-103-A are bearing units featuring unbreakable malleable housings. Specifications, comparison charts and load rating charts on pillow blocks, flange blocks and take-up units are included. Browning Mfg. Co.

139 Flexible Couplings—Ten-pp Bulletin 5103 covers the full line of Sure-Flex couplings, including "juniors" with flanges of zinc alloy and large bushed couplings fitted with Sure-Grip interchangeable QD-type tapered bushings. New engineering data also given on spacer couplings with drop-center sleeves and on use of Sure-Flex couplings with a floating shaft to connect two shafts. T. B. Wood's Sons Co.

PUMPS

140 Process Pumps—Heavy duty process pumps designed to meet a variety of severe operating conditions are illustrated and described in 12-pp Bulletin 725.5. Specifications and performance data, parts list, materials of construction, interchangeability chart included. Goulds Pumps Inc.

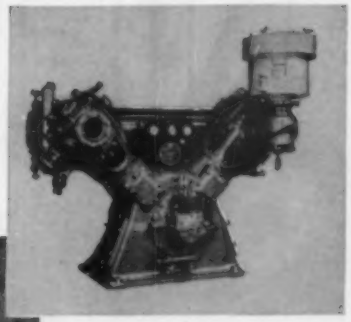
141 Close-Coupled Pumps—Catalog D-101 describes close-coupled pumps for use in any type of package equipment regulating a small pumping unit. Design advantages and construction details are outlined, and performance curves included. C. H. Wheeler Co.

142 Submersible Sewage Pumps—Eight-pp Bulletin 7300 describes company's Demersible sewage pump which can be installed for temporary service or permanently set for continuous service. Features of pump and motor are shown, materials of construction outlined, and performance tables given. The Deming Co.

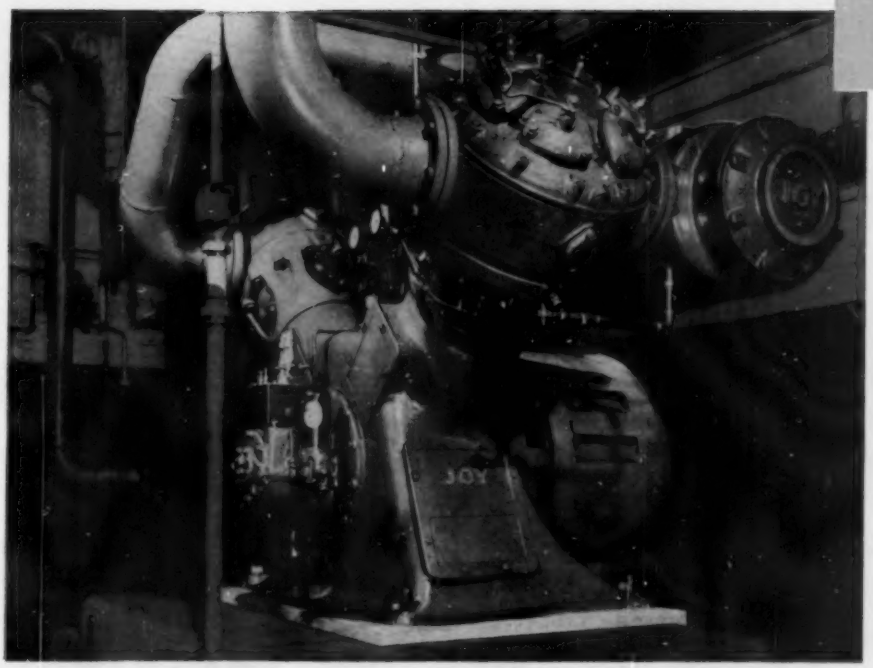
ELECTRICAL

143 FHP Motors—Twelve-pp Bulletin GEA-6424A discusses features and advantages of company's fractional horsepower, Form G, general purpose motors, including capacitor-start, split-phase, permanent-split capacitor, shaded-pole and polyphase motors. Sixteen different kinds of fhp motors ranging from those for machine tools to room air-conditioner motors shown. General Electric Co.

(More Bulletins on page 278)



Compact design means simple installation. Set up on a simple block foundation, bolt down and connect air and water lines.

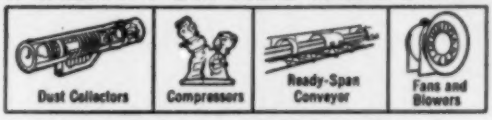


the COMPACT compressor with big compressor features...Joy WN-112

Only the package designed WN-112 has such heavy-duty features as replaceable cylinder liners and crosshead guides. These liners are made of special alloys which make possible fine machining and mirror-like polishing. The crosshead has no wedges, set screws or shims—never requires adjustment. The main bearings never need adjustment either because they are anti-friction, heavy duty ball, or spherical roller type. These, and other big compressor features add up to trouble-free performance that has made friends of literally thousands of plant and power engineers throughout industry.

When you are expanding your operations and require more compressed air, make sure you have details and complete information on the WN-112, one of a complete line of compressors for industry. You can then select any one of 24 standard models of the WN-112 plus special models for high and low pressures as well as oil-free operation. Capacities from 480 to 1072 cfm. Write for bulletin 340-15.

AIR MOVING EQUIPMENT FOR ALL INDUSTRY



JOY

Joy Manufacturing Company
Oliver Building, Pittsburgh 22, Pa.

In Canada: Joy Manufacturing Company (Canada) Limited, Galt, Ontario

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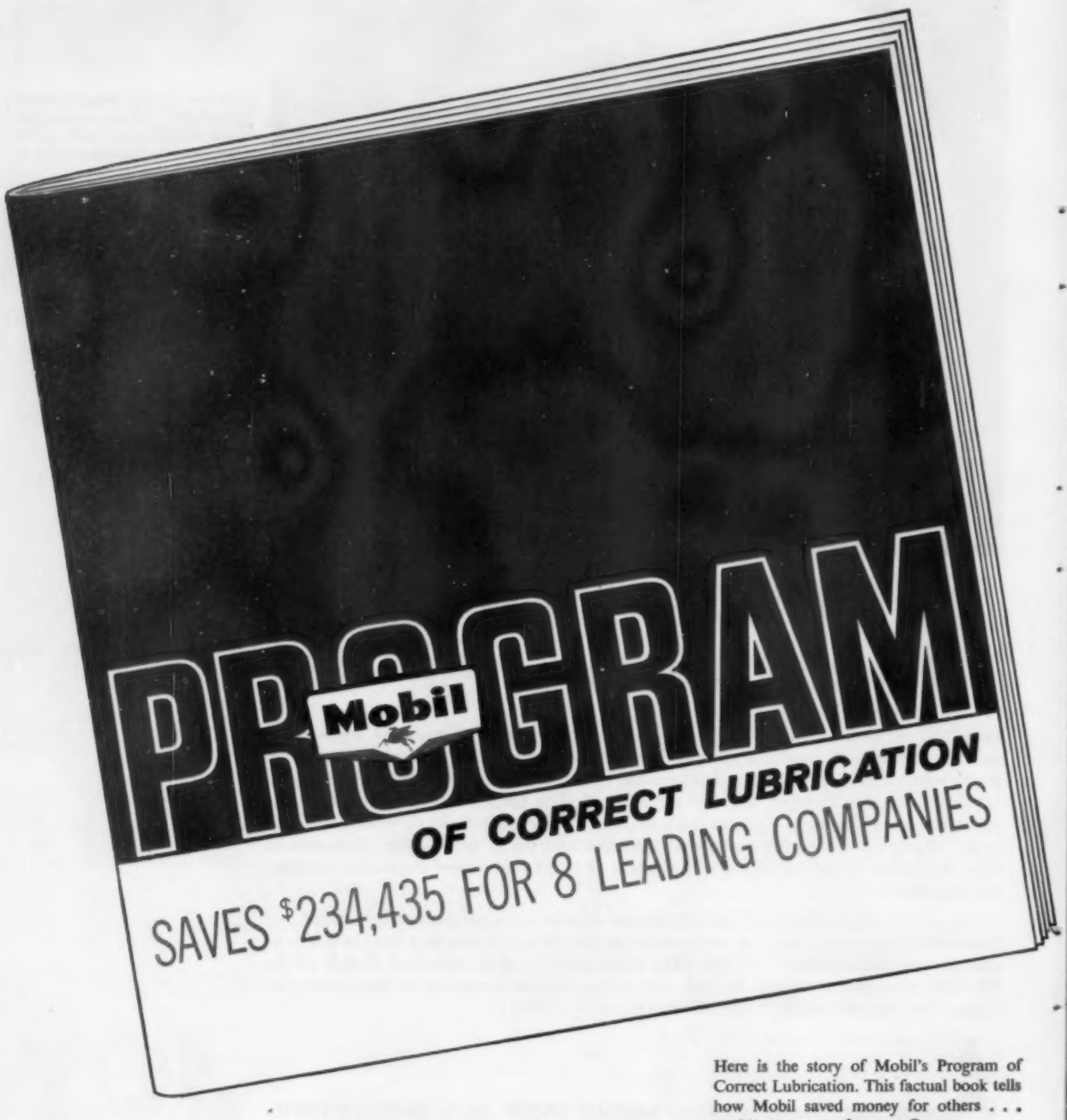
NEW TOOL



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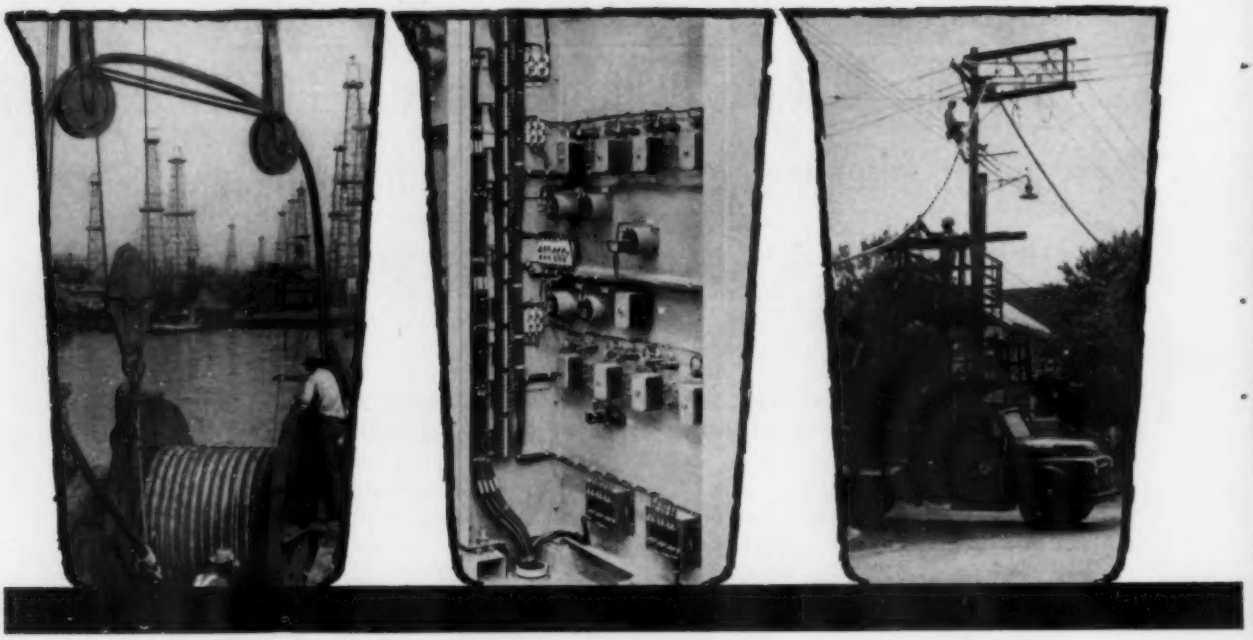
PREMIUM QUALITY INSULATION COMPOUNDS



AQUASEAL

low SIC, superior, rubber compound that is heat and water resistant, used on single and multiple-conductor cables at ratings up to and including 2KV a-c or d-c. Recommended for dry, alternately wet and dry, and continuously wet locations, subject to a-c or d-c potentials at either polarity, and at a maximum conductor temperature of 75C.

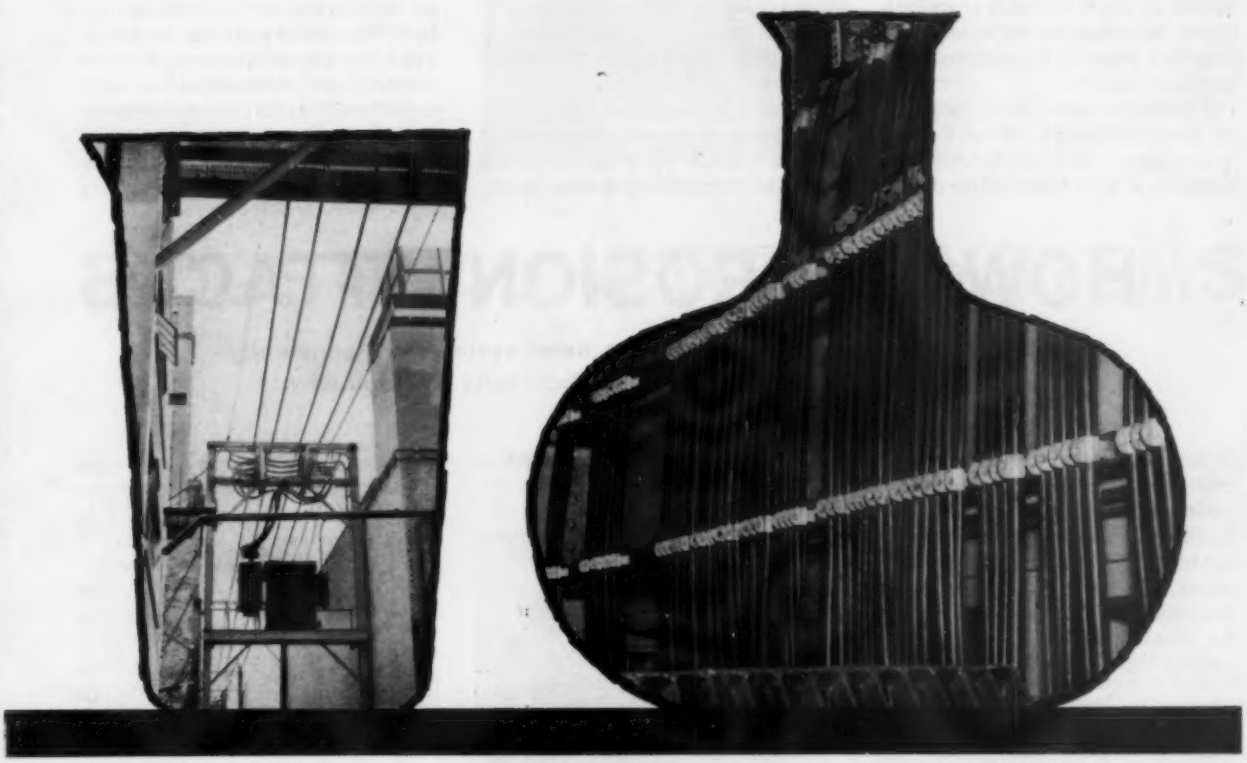
GENCORONE

high-voltage, ozone-resistant insulation of the oil base type, with exceptional physical and electrical stability. Resists the effects of moisture, sunlight, weather and earth solutions. Permits liberal current ratings consistent with maximum continuous operating temperatures of 75C for 8KV service or lower and 70C for higher voltages.

BUTARONE

high-voltage, butyl-base compound with exceptional resistance to ozone, low water absorption, and excellent resistance to heat. Suitable for both low and high-voltage applications, it has excellent electrical stability and resistance to aging. Operates at 90C up to 5KV and at 85C at higher voltages.

In the modern General Cable laboratories, some of America's foremost rubber chemists create, test and evaluate new insulation compounds in a continuous program of research and development. Materials for standard service conditions and special constructions to satisfy unusual requirements have all proven their worth in superior performance in power and control cables over many years. A few of the basic compounds from General Cable's long list are briefly described on these pages.



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and many other compounds in the rubber group are available for low and moderate voltage power cable service in wet locations, where high temperatures are encountered or where high current carrying capacity is required.

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in the thermoplastic group, as well as high-molecular-weight polyethylene, which is another outstanding General Cable thermoplastic insulation.

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HELPFUL WATER CONDITIONING DATA FROM BETZ

HOW CORROSION ATTACKS

Boiler, cooling and process water systems are constantly plagued by corrosion. This article tells how and why.

CORROSION can be defined as the destruction of a metal by chemical or electrochemical reaction by its environment. In the corrosion of ferrous metals in contact with moisture, reversion of the metal to the oxide form takes place. The driving force or the tendency to corrode is electrochemical. However, the rate at which corrosion proceeds is largely dependent on the resistance to continued attack by the products of the corrosion reaction.

In industrial water systems, the principal factors influencing corrosion of ferrous metals are the water characteristics, temperature, rate of flow and the contact of dissimilar metals. The chief variables controlling the characteristics of a water are its dissolved oxygen content, carbon dioxide concentration, pH and dissolved solids. Other factors are involved, of course, such as the possible presence of free mineral acid, hydrogen sulfide, sulfur dioxide, etc. In addition, certain bacteria may be a factor.

Dissolved Oxygen

The presence of oxygen is usually essential for serious corrosion to take place in natural waters. Dissolved oxygen will greatly accelerate corrosion in acid, neutral, or slightly alkaline waters.

The corrosion of iron in pure water in the presence of oxygen may be expressed in a simplified way by the following equations:

(a) Fe (iron metal) $+ 2H^+$ (hydrogen ion) $\rightleftarrows Fe^{++}$ (ferrous ion) $+ 2H^\circ$ (hydrogen atoms)

This is the typical primary reaction, in which iron enters the solution as ferrous ions, and hydrogen ions take up the charge and plate out as hydrogen atoms and thus maintain the system electrically neutral. This primary reaction is followed by either the destruction of the film of hydrogen by reacting with dissolved oxygen:

(b) $2H^\circ$ (hydrogen atoms) $+ \frac{1}{2}O_2$ (dissolved oxygen) $\rightarrow H_2O$ (water)

or the hydrogen can be removed as bubbles of gas:

(c) $2H^\circ$ (hydrogen atoms) $\rightarrow H_2$ (hydrogen gas)

Reactions (b) or (c) must take place in order to permit reaction (a) to proceed. Otherwise, the presence of the hydrogen film obstructs further progress of the primary reaction either by insulating the iron from the solution or by the increasing tendency of the hydrogen in the film as it is built up, to re-enter the solution and thus oppose the corrosion tendency.

In natural waters containing dissolved oxygen, reaction (b) is the controlling factor and corrosion is almost directly proportional to the oxygen content of the water.

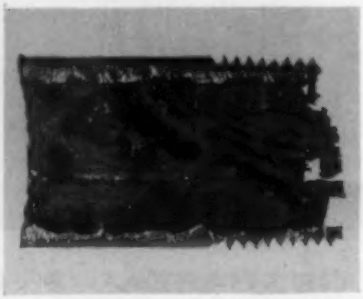

Figure 1 — Section of line showing pitting by dissolved oxygen.

The hydrogen ion in reaction (a) is available from ionization of water as follows:

(d) $2H_2O$ (water) $\rightleftarrows 2H^+$ (hydrogen ions) $+ 2OH^-$ (hydroxyl ions)

When hydrogen is plated out, the hydroxyl ions remaining cause an increase in the alkalinity adjacent to the point of corrosion. The ferrous ions entering solution will tend to precipitate as ferrous hydroxide. In the presence of dissolved oxygen, the ferrous ions will be oxidized to ferric hydroxide. Depending on the supply of oxygen, the resulting corrosion products will usually consist of black or green ferrous hydroxide next to the metal and reddish-brown ferric hydroxide which forms the outer layer, with graded mixtures of the two in between. The initial rate of corrosion is usually much greater than the rate after a longer period of time due to barriers set-up by the reaction products.

pH

At a pH below 4.3 (the region of free mineral acidity) the chief controlling factor in promoting corrosion is pH and the hydrogen film is removed by hydrogen evolution as shown by reaction (c). In the free mineral acid range the ferrous ions entering solution will remain soluble and therefore no insoluble reaction product will result. In the absence of a barrier the corrosion rate in acid solutions is therefore rapid. When the solution contains dissolved oxygen in addition to a pH value in the free mineral acid range, the rate of corrosion is further accelerated.

At a pH above approximately 9.5, as the alkalinity increases the pH or hydrogen ion activity decreases and the primary reaction as illustrated by equation (a) is slowed down. The rust coating formed in alkaline solutions is a more protective barrier than the one formed in neutral solutions. Therefore, the rate of corrosion is appreciably decreased and in fact in an alkaline solution, a negligible amount of corrosion will take place at normal temperatures and in the absence of dissolved oxygen. However, in the presence of dissolved oxygen, reaction (b) will still be controlling and while the rate of corrosion will be appreciably decreased a serious amount can still result.

At a pH between these limits (4.3—9.5) the presence of dissolved oxygen plays a more important role than the pH.

Dissolved Solids

In general, increase in dissolved solids content of a water increases the corrosivity. The electrolytic theory views the corrosion mechanism as an electrolytic cell. The iron metal provides both the anode and the cathode of the cell and the water is the electrolyte. At the anode,

the metal dissolves in the water, and in so doing it gives up two electrons which flow through the metal to the cathode where the electrons combine with the hydrogen ion to plate out hydrogen atoms as a film on the cathode. Various explanations have been advanced for the corrosive effect of higher dissolved solids. Higher dissolved solids increase the conductivity of the water thus favoring corrosion. One logical theory involves the effect of ions in destroying or altering the coating of corrosion products on the metal. A loose non-adherent coating under ordinary conditions may accelerate the rate of corrosion locally and produce a pitting condition, whereas a uniform, adherent coating may form an effective barrier and reduce the corrosion rate considerably. The chloride ion in particular exerts an adverse effect and within certain limits of concentration permits accelerated attack.

tact of dissimilar metals is known as galvanic action. The tendency of a metal to dissolve and enter solution as an ion is measured by the electrode potential between the metal and its ions. The listing of the electrode potential of the various metals constitutes the familiar

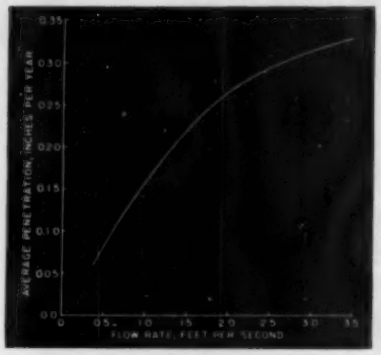

Figure 2—Influence of flow rate on corrosion.

ferrous bicarbonate, tends to elevate the pH and as the pH increases above 5.9, the reaction rate becomes reduced. The hydrogen formed in the reaction will also have a retarding effect particularly when the pH exceeds 5.9. The ferrous bicarbonate formed in the reaction is soluble and can be carried along with the condensate. When dissolved oxygen is also present, it will accelerate the rate of corrosion by removing the hydrogen to form water.

Other Factors

Corrosion of ferrous metals in the presence of moisture is a complex subject. Many other variables will affect the corrosion rate, such as homogeneity of the metal, condition of the metal surface, ratio of surface areas exposed by two dissimilar metals, static and cyclic stresses, oxygen concentration cells, etc.

INDUSTRIAL WATER SYSTEMS

Temperature

The chemical reactions of corrosion increase in rate with increase in temperature. Increased temperature decreases water viscosity and thus increases the diffusion rate of oxygen. Electrical conductivity is increased at higher temperatures, thus producing an effect similar to increase in dissolved solids. Pitting may be enhanced where adjacent metal areas vary in temperature, with the hotter sections anodic (more corrosive) to the colder areas.

Flow Rate

Increase in the rate of flow tends to increase the corrosion rate. Figure 2 illustrates data secured through the exposure of ¼" tubular low carbon steel specimens to Philadelphia (Delaware supply) tap water at a temperature of 120 F. The corrosion rate increases rapidly with increase in flow rate although at higher flow rates the influence is less pronounced. The influence of flow rate on corrosion is primarily due to the increase in supply of dissolved oxygen which destroys the hydrogen film in keeping with reaction (b).

Dissimilar Metals

The corrosion that occurs from the contact of dissimilar metals is known as galvanic action. The tendency of a metal to dissolve and enter solution as an ion is measured by the electrode potential between the metal and its ions. The listing of the electrode potential of the various metals constitutes the familiar Electromotive Series. The electrode potential of hydrogen is defined as zero. The metals that are higher in the series are considered able to displace those metals lower in the series.

The Electromotive Series cannot be taken as a precise indication of galvanic action. The potentials of various metals can be altered by ion concentration, temperature and the corrosive environment.

Carbon Dioxide

In a neutral water, taken from surface supplies where dissolved oxygen is present, the presence of carbon dioxide has little effect on the corrosion rate. However, many well waters, which are usually devoid of oxygen, will be found to contain appreciable amounts of carbon dioxide. In steam and condensate systems, it is possible to encounter serious corrosion from carbon dioxide even in the absence of dissolved oxygen.

When carbon dioxide dissolves in water it forms carbonic acid which is a weak acid and produces corrosion in keeping with the following reaction:

(a) Fe (iron) + $2H_2CO_3$ (carbonic acid) → $Fe(HCO_3)_2$ (ferrous bicarbonate) + H_2 (hydrogen)

The above reaction proceeds rapidly at a pH below 5.9. The reaction product, ferrous bicarbonate, tends to elevate the pH and as the pH increases above 5.9, the reaction rate becomes reduced. The hydrogen formed in the reaction will also have a retarding effect particularly when the pH exceeds 5.9. The ferrous bicarbonate formed in the reaction is soluble and can be carried along with the condensate. When dissolved oxygen is also present, it will accelerate the rate of corrosion by removing the hydrogen to form water.

Water characteristics also are influenced by factors such as hydrogen sulfide, chlorine, and biological factors—all of which can accelerate markedly the corrosion rate.

Despite the complexity of the problem, great strides have been made in methods for control of corrosion. Continuing research by BETZ LABORATORIES has led to a better understanding of the effect of different variables, as well as provided increasingly effective control methods. A Betz Field Engineer will be happy to discuss your corrosion problem as it relates to any boiler, cooling or process water system.

No obligation, of course.

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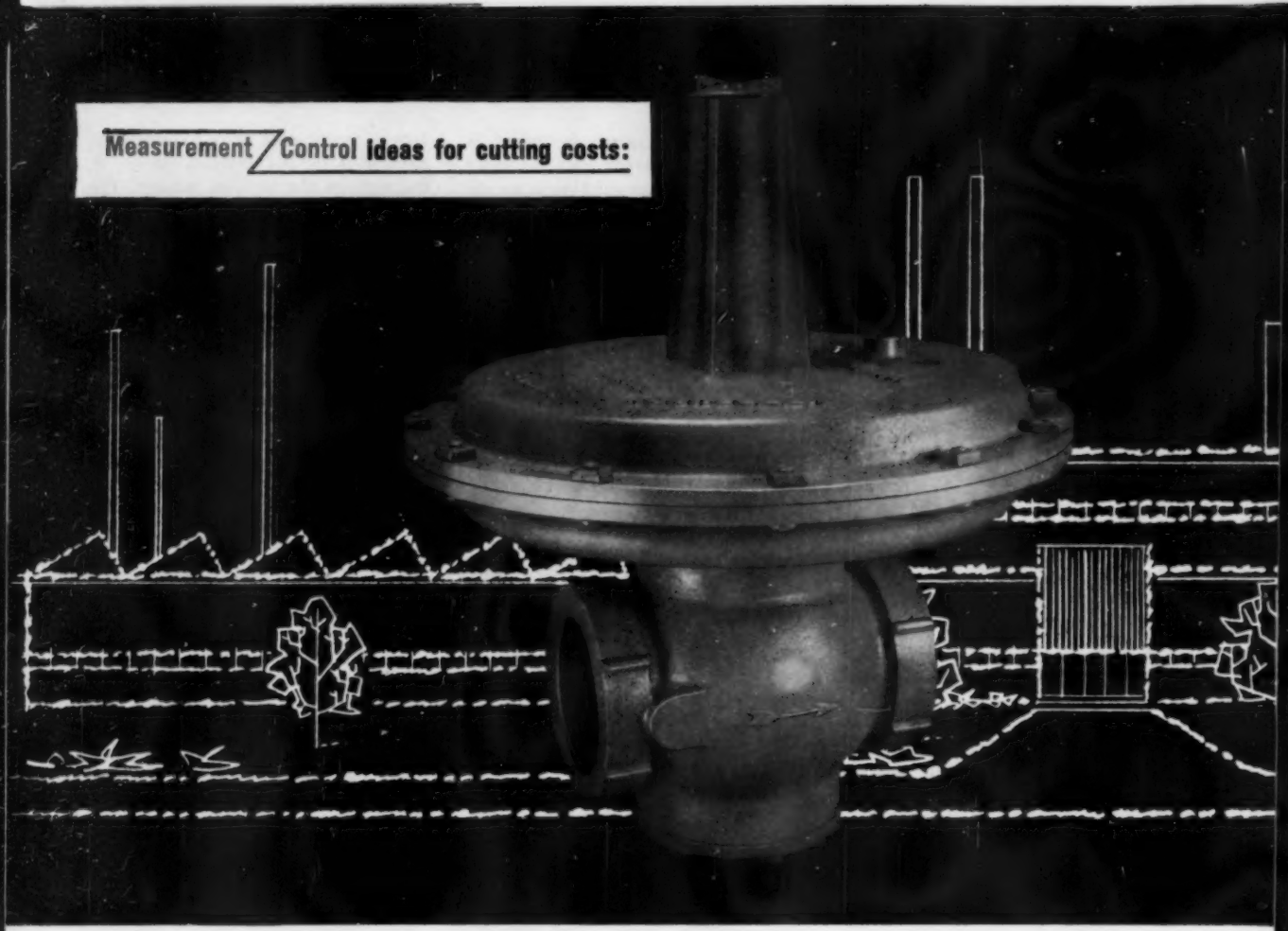
CONSULTANTS ON INDUSTRIAL WATER PROBLEMS



The $40.00 regulator that could have saved $30,000.00

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The Rockwell Field Engineer who personally rushed another regulator to this customer pointed out that an extra stand-by regulator would cost only $40.00—low-cost insurance against a possible $30,000.00 loss. The customer followed this recommendation, as well as others which the Field Engineer made in the interest of more efficient handling of measurement and control functions in this plant.

There are many ways a Rockwell Field Engineer can help *you* save time, money, and material wherever gases or liquids flow through pipe in your plant. He represents the largest and most experienced manufacturer of measurement and control products—and this experience can pay off for you. New or different uses of valves or regulators can prevent waste and inefficiency. Rockwell gas and liquid meters can measure almost anything that flows through a pipe, and can often assure big savings in time and labor, while improving quality.

It costs nothing to talk to a Rockwell Field Engineer—simply send the coupon.

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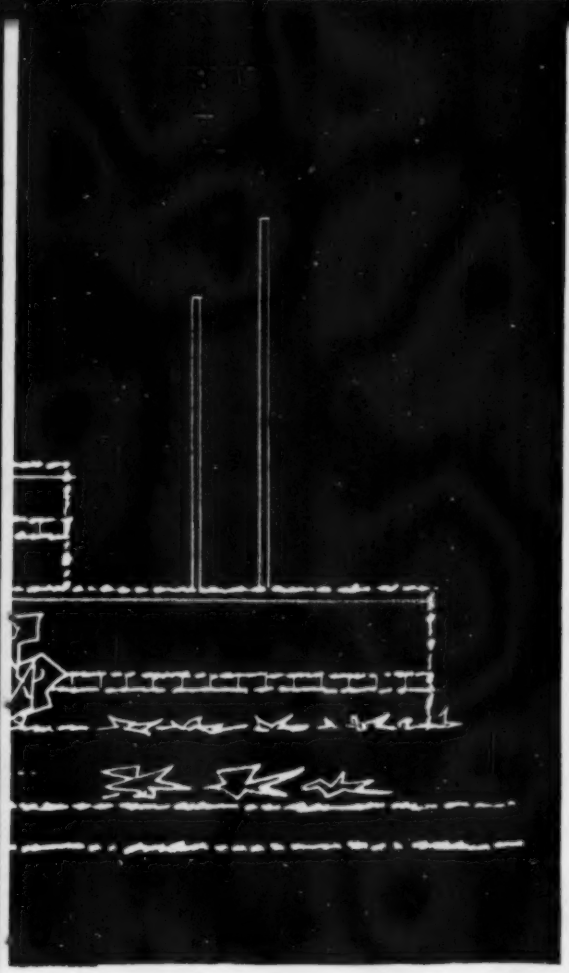
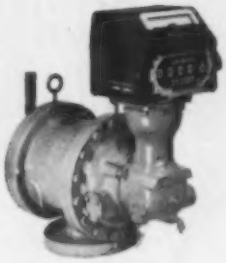


"IN-PLANT" METERING:

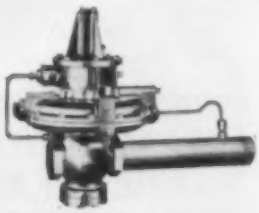
LIQUIDS AND GASES

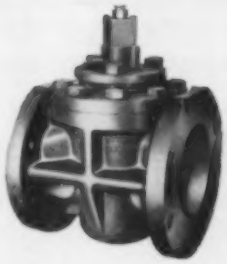


"IN-PLANT" METERING can mean new cost cutting opportunities. Accurate liquid and gas meters are a positive way of improving cost control, insuring better use of materials, sharpening inventory control, and preventing waste. Whatever the need, Rockwell has the right liquid or gas meter to do the job better and at lower cost.

CONTROLLING PIPED MATERIAL:

LIQUIDS AND GASES





CONTROLLING PIPED MATERIAL more efficiently is a positive step towards cost cutting. Better valves can save wasted products and materials and often increase plant safety. Gas pressure regulators can cut costs by assuring safe, economical use of any gas used in the plant. Rockwell has the world's most complete line of flow control devices.

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BACKTALK AND FORETHOUGHTS

Edited by Marjorie E. Weissman

Pipe Insulation Repair

PLANT ENGINEERING:

"On page 118 of your December, 1959 edition of PLANT ENGINEERING, you gave an account entitled 'One Way To Repair Pipe Ell Insulation.' This covered a product made by the General Aluminum Supply Corp.

"Will you please send us the address of this concern so that we can communicate with them? We are interested in their product for use in our power plant and paper mill." *Isadore Newman, President, Newman & Co., Inc., Philadelphia. Pa.*

PLANT ENGINEERING:

"Please give me the address of the General Aluminum Supply Corp., mentioned on page 118 of your December 1959 issue." *William U. Pursell, Plant Engineer, Walter Baker Chocolate, General Foods Corp., Dorchester, Mass.*

PLANT ENGINEERING:

Please send us a tear sheet of the article about humped elbows which appeared on page 118 of your December, 1959 issue." *L. C. Strow, Plant Engineer, Libbey-Owens Ford Glass Co., Ottawa, Ill.*

► This article described a method of repairing pipe ell insulation in five minutes without cutting, fitting, drying, or cleaning up, by using Humped Elbows. These elbows are made by General Aluminum Supply Corp., 1506 Eastern Ave., Kansas City 26, Mo.—*Editors.*

Sizing Compressed Air Piping

PLANT ENGINEERING:

"Do you have tear sheets of a nomograph for use in sizing pipe for compressed air, if so please send a copy. If not, the name and address where I may be able to obtain one.

"I am a regular reader and user of the fine magazine PLANT ENGINEERING." *W. L. Cooper, Martel-Henrietta Mills, Spartanburg, S. C.*

► We do not have available a nomograph for this purpose, but we have sent this reader several charts designed for the same purpose which we believe will be useful.—*Editors.*

Plaudits for Plant Engineering

PLANT ENGINEERING:

"Many thanks for sending me the statement on plant engineering which you carried in January, 1960. We appreciate that this kind of story is doing a great deal to build the self-esteem of our plant engineers and thus enable them to do a better job—both for themselves and the company." *Macauley Whiting, General Manager, The Dow Chemical Co., Midland, Mich.*

PLANT ENGINEERING:

"Sincerely appreciate the fine treatment accorded us in your January, 1960 issue.

"Your courtesy through this matter and your consideration for our ideas was refreshing and really appreciated by myself personally. PLANT ENGINEERING cannot help but be a successful publication." *R. N. Carlen, Vice President, Joseph T. Ryerson & Son, Inc., Chicago, Ill.*

► Mr. Whiting and Mr. Carlen were among the members of general management who were interviewed by Associate Editor Marjorie Weissman on the contributions of their plant engineers to their respective companies. The interviews were published in our January, 1960 issue.—*Editors.*

Maintenance Storage Layout

PLANT ENGINEERING:

"We would like to have a bibliography about all the articles written in your magazine in relation to the layout of maintenance stores (spare parts, construction and repair materials, etc.) in connection with maintenance department needs.

"We are projecting a maintenance store and we would like to have in mind all the ideas we can collect about the best way to design a maintenance store to save time and handling for the maintenance department and maintenance store people. Your help in this matter will be very much appreciated." *Ricardo Cueva, Engineer, Celory, S.A., Monterrey, Mexico.*

► We have published a number of articles on the layout of storage space for maintenance purposes and have forwarded them to Mr. Cueva with our compliments.—*Editors.*

Reprint Coming Up

PLANT ENGINEERING:

"In your December, 1959 issue I read three articles that I became very interested in.

"One was the article on the 'Proximity Detector.' I would appreciate

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Hose which offers the long-term economy of Du Pont neoprene and HYPALON is available through your local rubber goods distributor. He can suggest which of the two synthetic rubber hoses best meets your particular requirements.

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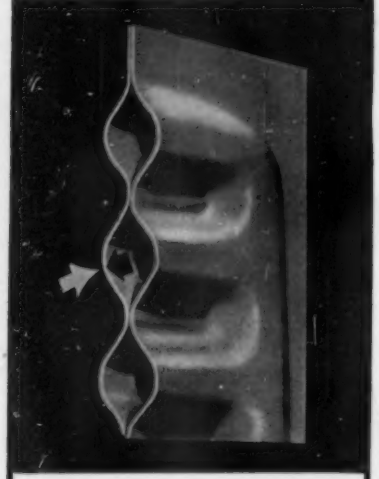

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BACKTALK—FORETHOUGHTS

receiving all the additional information you have on this detector.

"Another article was Part 6 of your 'Time Saver' series. I would like tear sheets for all six of the previous article and the subsequent articles in the 'Time Saver' series.

"The other article was the third in a series of 'Pneumatic-Hydraulic Actuation Systems.' I would like tear sheets for all three of these articles and all subsequent articles. Thank you very much." *Roy G. Guenin, Chief Engineer, Rea Magnet Wire Co., Inc., Fort Wayne, Indiana.*

▶ While the supply of tear sheets lasts, we are glad to send them to readers. The "Time Saver" series will be reprinted after its completion in May, and will be available for $1.50 a copy. —*Editors.*

Cost Estimating Series in Demand

PLANT ENGINEERING:

"I have been collecting from your magazine the time saving series on construction cost estimating.

"I have parts 3,4,5 and 7 in my files. I find they are very useful in our Engineering department in estimating erection costs of buildings.

"If available to you, would you please forward to my attention, the missing parts of this series which I do not have. In the future, I will try to be more attentive in the collection of these construction estimates from your magazine.

"Your cooperation in forwarding the above requested information is most appreciated." *Hubert A. Reigle, Asst. Plant Engineer, Alsco, Inc., Gnadenhutten, Ohio.*

PLANT ENGINEERING:

"Congratulations for printing an interesting series-to-come that will prove very helpful to plant engineers all over the country. When the series is over, will you please reserve us a copy of the reprints in booklet form." *R. A. Melton, Divisional Manager of Plant Engineering, Stamping Div., Chrysler Corp., Detroit, Mich.*

Tear Sheets on the Way

PLANT ENGINEERING:

"Your December, 1959 issue of PLANT ENGINEERING has just crossed my desk and the articles titled 'Ten Important Check Points for Ordering A-C Motors,' 'What Size Air Compressor?' and 'Plastic Piping, Engineering Survey,' which commence on pages 98, 104 and 123 respectively, are of interest to me. Since the magazine circulates in our office to other engineers, I do not wish to mutilate it by tearing out pages. With this in mind, I would like to know if I could obtain a set of tear sheets of each article." *E. R. Hottenstein, Mechanical Engineer, Nuclear Energy Div., Gilbert Associates, Inc., Reading, Pa.*

PLANT ENGINEERING:

"We should be obliged if you could let us have tear sheets of the article 'Investigate Before You Plan Plating Department Design' which appeared in the October, 1959 PLANT ENGINEERING." *E. J. Mann, Training Officer, The Glacier Metal Co. Ltd., Kilmarnock, Scotland.*

USAF Maintenance Program

PLANT ENGINEERING:

"Please, if possible, send me two tear sheets of 'More Maintenance Per Dollar' parts 1 and 2, appearing in your November and December, 1959 issues, respectively. The article contained some very good information and I sent my tear sheets to Mr. Williams of Sewart A F B, a gentleman I met on active duty last summer." *Bernie Head, Plant Engineer, P. Lorillard Co., Louisville, Ky.*

Plastic Piping Survey

PLANT ENGINEERING:

"Would you be so kind as to send 15 copies of the article on plastic piping that appeared in the December, 1959 issue of PLANT ENGINEERING, to the attention of the undersigned." *D. A. Torisky, Advertising Manager, A. M. Byers Co., Pittsburgh, Pa.*

▶ This article was the result of a PLANT ENGINEERING reader survey to find out how and to what extent plastic piping and plastic valves are being used in industry, also what users think of them. If you think this five-page summary can help you, ask for tear sheets of "Plastic Piping, Plastic Valves—a Plant Engineering Reader Survey."—*Editors.*

Polyurethane in the Plant

PLANT ENGINEERING:

"Please send information on the brand of polyurethane described in the article on page 126, of your September, 1959 issue. Thank you." *Neil H. Patzer, Engineering Department, Molded Fiber Glass Boat Co., Union City, Pa.*

▶ Our article described several plant uses of foamed-in-place polyurethane such as insulation for piping, for "cocooning" small tanks, and for replacing air in tires.—*Editors.*

For more facts circle 523 on Reply Card →

Just 75 years ago, heating was about as unpredictable as the weather, as temperatures alternated between shivery low and smother-high. Then a Wisconsin schoolteacher named Johnson decided to do something about classroom comfort and thereby launched a new industry!

The Story of the Thermostat

Actually this is the story of a symbol . . . the symbol of an industry that has brought comfort, safety, better health, and efficient working conditions to people all over the world.

. . . In a specially equipped manufacturing plant, delicate missile parts and components, with micro-inch tolerances, must be made under temperature and humidity conditions that never vary. At every step in their manufacture, modern pneumatic controls assure error-free regulation of the thermal environment.

. . . A multi-million dollar computer laboratory undertakes a difficult problem in space-age design calculations. To prevent costly damage, the complex data processing equipment must operate within precise limits of temperature and humidity. Another important job handled best by pneumatic controls!

. . . In a hospital, surgeons perform a lifesaving operation. Accurate pneumatic controls maintain the temperature and humidity at preselected levels to conserve the patient's strength during surgery.

. . . Far at sea, one of the nation's deadly new submarines cruises undetected, an elusive, power-laden sentry of the "Silent Service." Her crew lives and works in comfort and safety — in a climate precisely regulated by a pneumatic control system.

. . . Across the continent, pneumatic controls assure safe air conditions in the highly critical processing areas of an atomic energy facility. Pneumatic controllers of extreme sensitivity operate constantly to assure safe disposal of waste air and prevent the escape of contamination.

These are but a few examples of the ways in which modern pneumatic controls play a vital part in regulating the environment in which we live and work — helping to create made-to-order indoor climate for every purpose, controlling temperatures and humidities to a degree undreamed of when Professor Warren S. Johnson invented the first automatic temperature control system back in the 1880's.

Inventor at Work

Though he was probably unaware of the fact at the time, Professor Johnson became the founder of the automatic temperature control industry when he devised a practical way to eliminate the problem of classroom temperatures that seemed to zigzag forever between shiver and swelter.

His first attempt at control — the "annunciator" system — merely called the janitor's attention to overheating, or lack of heat, by ringing a bell in the furnace room. The janitor would then open or close the classroom dampers, as required.

But this land-based version of a ship's telegraph soon gave way to an all-electric method, utilizing a thermostat in each room that would open and close the dampers automatically. And so, the first system of automatic heat regulation was born.

The Electro-Pneumatic System

Intrigued with the possibilities of his long-awaited discoveries, Professor Johnson in 1883 left his post at Whitewater, Wisconsin, State College and came to Milwaukee to devote full time to refining and marketing the Johnson System.

His second major achievement, an electro-pneumatic control system, occurred almost at once. By successfully uniting the forces of *electricity*, for thermostat operation, and *compressed air*, for valve and damper operation, he developed a far more dependable and fully automatic control system. Finally he was ready to go out and revolutionize the comfort standards of the world. In 1885, he incorporated the business which today bears his name.

With branches established in Chicago, St. Louis, and New York, the Johnson thermostat on the wall soon became a familiar sight in the leading buildings of the day. Schools, prominent residences, and small business buildings were first to enjoy the comforts and economies of automatic control. They were followed closely by colleges, hospitals, public buildings, offices, stores, and industrial plants.

From Mikado to Czar

Acceptance grew, markets widened. The fame of automatic controls traveled fast and far. Before 1890, the city of Berlin, Prussia, had written a report about the efficiency of its Johnson System. Later, the palace of the Mikado in Japan was equipped with Johnson Control. The King of Spain and other European royalty became Johnson customers. A special installation was made in the Kremlin in Moscow!

Single Responsibility

Professor Johnson had the foresight to realize that the key to his success depended upon the *proper application* of his controls. Accordingly, he determined, from the outset, that his company should *never sell devices*, but should sell a *principle of control*. This meant that each system would have to be planned, manufactured, installed, and serviced *by Johnson* to meet the exact needs of the individual building.

Over the years, this policy of complete responsibility by a single specialized organization has insured owner satisfaction and saved untold millions of dollars for Johnson customers.

Carrying out this policy has also resulted in the closest possible working relationship between the Johnson organization and the nation's consulting engineers and architects, in a joint effort to provide ever better control of thermal conditions.

Many Johnson "Firsts"

The history of the thermostat and the Johnson Service Company coincides with the period when other pioneers were busy introducing innovations in heating, cooling, and ventilating methods and in developing full-scale air conditioning. Working closely with the research staffs of these manufacturers, Johnson engineers were able to supply the most effective controls for every new development in basic equipment. This cooperation has continued and flourished to the present.

Over the years, the Johnson Service Company has been the source of a never-ending flow of new ideas, which have included virtually all of the key developments in the field of automatic temperature control!

By far the most important was the all-pneumatic control system, perfected in the 1890's and still the standard everywhere. Others include the all-metal thermostat, the famous *Dual* or day-night thermostat, the heating-cooling thermostat, summer-winter thermostats, the airstream thermostat, master-submaster thermostats, supersensitive gradual-acting thermostats, and powerful piston damper operators.

Another famous development was the Humidostat or humidity regulator. And, of course, the Comfostat, an exclusive Johnson instrument that controls room temperatures in relation to humidity conditions. The popular pneumatic control center, for centralized supervision and control of modern air-conditioning systems, also was first perfected by Johnson.

Uninterrupted Progress

As the concept of controlled environment gathered momentum, so did Johnson. Important "firsts" became routine jobs, as the industry looked to Johnson for the answers to new control problems. From the simple comfort needs of the buildings of the 80's and 90's, to the history-making demands of the first scientifically air-conditioned building, down to the most complex requirements of today's commercial and industrial buildings, Johnson has been the leader in the pneumatic temperature control field.

Johnson has an especially noteworthy record in meeting the intricate and highly diversified control needs of industry, with installations in thousands of leading manufacturing and processing plants.

In other fields, too, wherever you go, you'll find the important buildings are equipped with Johnson Control. From the fabulous Fontainebleau Hotel to the mammoth Merchandise Mart to the famous UN Secretariat Building . . . in schools, in hospitals, in research laboratories, in vital military installations, in shopping centers, in buildings of *every* size and type and in ships at sea . . . there are temperature and air-conditioning control systems by Johnson.

Johnson Today... and Tomorrow

To make certain that each installation performs up to expectations, Johnson backs its engineers with the most complete line of pneumatic temperature, humidity, and pressure control equipment in the industry.

To serve you most efficiently both before and *after* a sale, Johnson maintains the largest and most experienced field organization in the industry, with 107 completely staffed branch offices in the United States and Canada, plus full-time, factory-trained installation and service mechanics in over 200 other cities.

This is by no means the end of the story of the thermostat. For against this unmatched background of innovation, experience, and service, Johnson's never-ending search for new and better controls will inevitably lead to dramatic new ideas in the years ahead. As the day of completely air-conditioned cities approaches and as new and unprecedented demands for precision controls evolve, the forward-thinking Johnson organization will always be ready with the right answers.

The Johnson research and development staff and facilities have been expanded three times in the past four years. And final plans for the next major expansion are already underway! In the future then, as in the past, you can continue to look to Johnson for the world's finest controls!

Johnson Service Company, Milwaukee 1, Wisconsin. In Canada: Johnson Controls Ltd., Toronto 16, Ontario.

JOHNSON CONTROL

PNEUMATIC SYSTEMS

DESIGN • MANUFACTURE • INSTALLATION • SINCE 1885

AD 1076

Printed in U.S.A.

Hall Industrial Water Report

VOLUME 8 APRIL 1960 NUMBER 2

How to Increase Your Salary

Water's insatiable appetite for iron and other commonly used metals and alloys is costing industry many millions of dollars every year. Effective treatment of water to reduce corrosion to a minimum can save a substantial chunk of these dollars and route them into the till. Thence into the stockholder's pocket as dividends and into your pocket as a reward for cutting costs.

Hall engineers know how to treat water to combat its attack of metals. They can help you save many of the dollars that are being spent for maintenance and repairs because of avoidable corrosion.

Elusive Oxygen

Sodium sulfite feed for chemical fixation of residual dissolved oxygen in the boiler feedwater at a southern paper mill is usually less than twenty pounds per day. A sudden threefold jump in the requirement puzzled the operators. The increase in dissolved solids necessitated more blowdown which, in turn, increased requirements for other water conditioning chemicals.

When Hall engineer T. W. Hubner was called in, the symptoms indicated either trouble in the deaerating heater or bypassing of the heater with water high in dissolved oxygen. The second possibility was the easier to check.

A search by the operators then located the trouble. A valve in a bypass line was partially open which accounted for the difficulty. When the valve was closed, water conditions returned to normal. Experience enabled Hubner to steer the search in the right direction.

Luxury Pays Off

An aluminum fabricator was forced to reduce production several times per year for removal of corrosion products from inert gas coolers. Water treatment to control the corrosion in the cooling system had been considered. However, the operation was a small one and it was felt that water treatment was a luxury.

Hall engineers surveyed the cooling water problem and found that the cooling system could be protected at a cost of less than sixty cents per day.

Results have confirmed the findings. The annual cost of water treatment, which now permits uninterrupted production, is less than the previous cost of a single heat-exchanger outage.

Unusual Corrosion Problems

Peculiar corrosion effects sometimes result from contact of acid and steel. They are of interest because they might be encountered in connection with acid cleaning or in equipment used to store and handle acid for water treatment.

Although the rate of reaction between 66° Baume sulphuric acid and steel is substantially nil, it is greatly accelerated if moisture is picked up from the atmosphere. Bubbles of hydrogen, generated by corrosion, presumably become detached from the metal, rise and accumulate in contact with metal at such locations as horizontal pipe. Resulting erosive and galvanic effects impair the normal protective oxide coating. Narrow, but sometimes deep, grooves can be produced.

Hydrogen blistering has been observed near or just above the liquid level in concentrated sulphuric acid storage tanks and in pickled steel. Atomic hydrogen from corrosion diffuses through the metal. Where the hydrogen atoms meet something that catalyzes the formation of molecular hydrogen, the larger molecules cannot pass on through the metal. Accumulation of gas occurs and pressure becomes high enough to tear apart the metal grains. Failure tends to proceed along planes of stress which are predominantly parallel to the surface in steel plate, so characteristic gas blisters result.

Rain Water in Compressor Coolers

Decreasing supplies of surface and ground water in eastern gas fields have forced compressor operators to rely heavily on rain water storage to provide water for cooling system makeup. This has resulted in rapid corrosion of black iron pipe and formation of heavy organic deposits on heat-exchange surfaces.

Hall engineers were handed a tough assignment. Prevent corrosion and deposits in closed systems of steel, cast iron and copper containing a naturally aggressive water contaminated with oil, saturated with oxygen, at high temperature—and do this economically.

A corrosion inhibitor of the borax-sodium nitrite type, containing a special inhibitor for copper (Hagan Corrosion Inhibitor CS) has provided the answer. Current corrosion rates of both copper and iron are of the very low order of 1 mg/dm²/day. Chemical cost is about 25 percent of what it was originally. A bonus is emulsification of the organic material by the inhibitor with less accumulation of deposits on the heat-exchange surfaces.

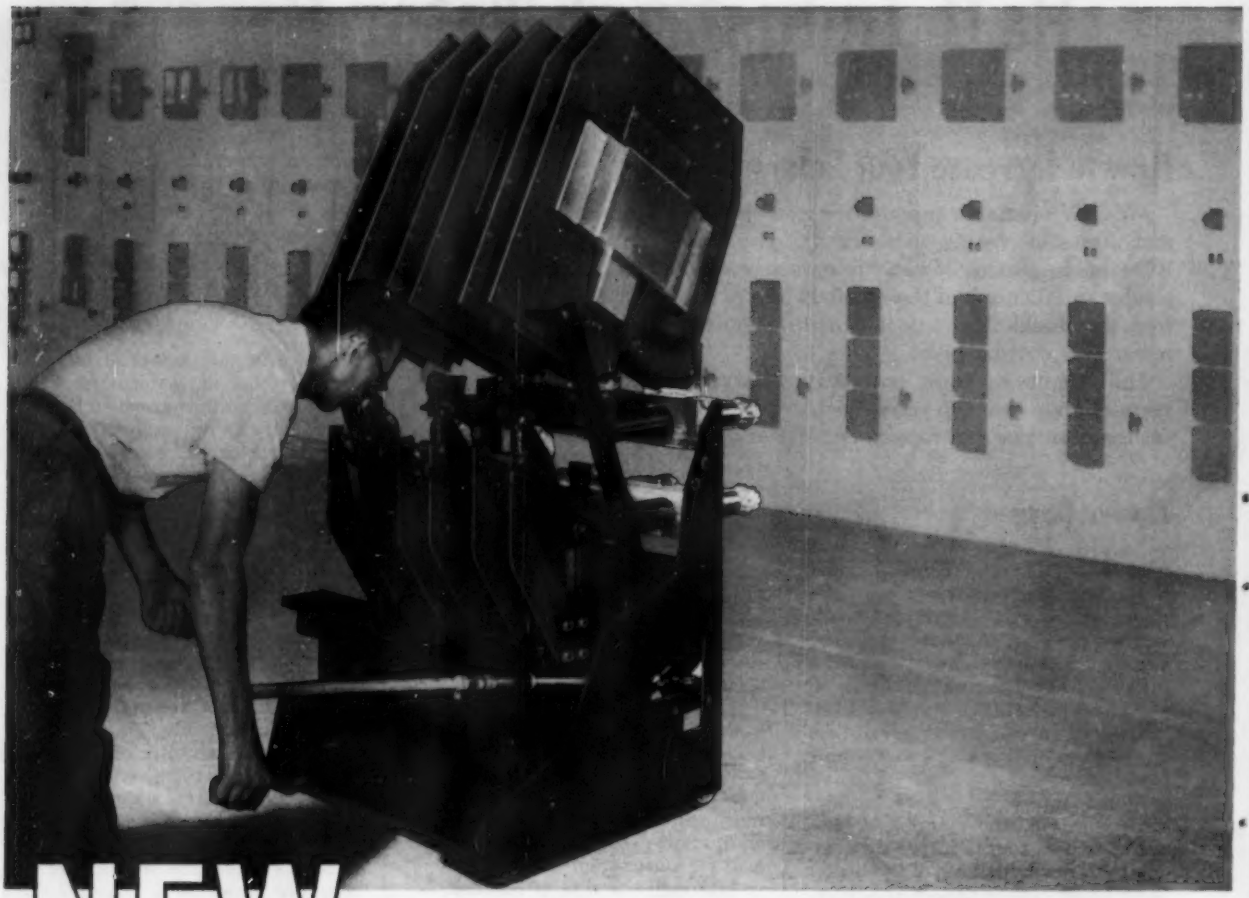
Water is your industry's most important raw material. Use it wisely.

Industrial Water Problems Require Special Handling

There are no "stock answers" to industrial water problems. For information on how the Hall System can help you solve your particular water problems, write, wire or call address below.

HALL LABORATORIES
HAGAN BUILDING, PITTSBURGH 30, PA.
Consultants on Procurement, Treatment, Use and Disposal of Industrial Water

DIVISION OF **HAGAN** CHEMICALS & CONTROLS, INC.
For more facts circle 524 on Reply Card



NEW...

HINGED ARC CHUTE of type DH magnetic air circuit breakers permits tilting of chute for full accessibility of arc chute interior and contacts for inspection. ISOLATED CENTER COIL design employed in the DH breaker arc chutes provides more efficient arc interruption.

DH BREAKER ADVANCES EXPAND CAPABILITIES OF METAL-CLAD SWITCHGEAR

Greater margins of safety and increased convenience of operation and maintenance . . . available with recent design advances in Westinghouse metal-clad switchgear

The HINGED ARC CHUTE of DH breakers affords ease of handling and facilitates inspection of arc chute interior and contacts. On smaller DH breakers, the arc chutes are tilted directly by hand. On larger breakers, the arc chutes are tilted by a compact, lightweight auxiliary device operated through the levering-in mechanism.

The ISOLATED, CENTER COIL DESIGN employed in the arc chutes of DH magnetic air circuit breakers permits more efficient arc interruption for any rating. This center coil design provides better magnetic field distribution . . . better insulation . . . increased field strength—all resulting in superior DH breaker performance.

LIMITRAK* INSULATION SYSTEM, a recent Westinghouse development, provides superior, balanced insulation in metal-clad switchgear. *Limitrak* glass polyester is used on DH breaker arc chutes, end channels and supports. *Limitrak* coating is employed on DH breaker bushings. *Limitrak* design is incorporated on porcelain bus supports of the metal-clad switchgear housing. Westinghouse *Limitrak* has been proved by test to be 300 times more track resistant than ordinary grades of glass polyester, and is also highly flame retardant. Get complete information on these Westinghouse metal-clad switchgear developments from your Westinghouse representative. *Trade-Mark

Quality Westinghouse metal-clad switchgear offers more value in continuity of service and economy of operation

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Westinghouse

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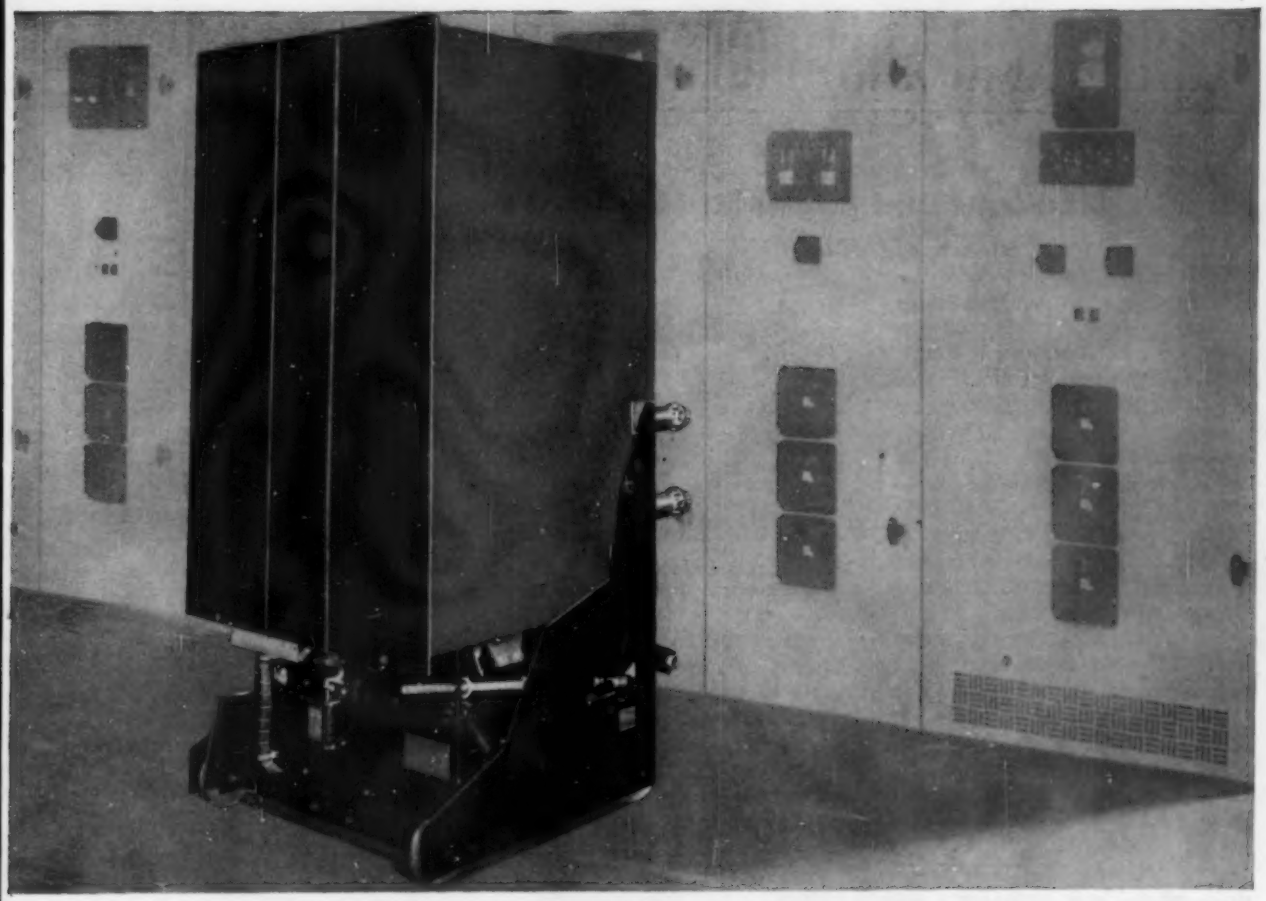
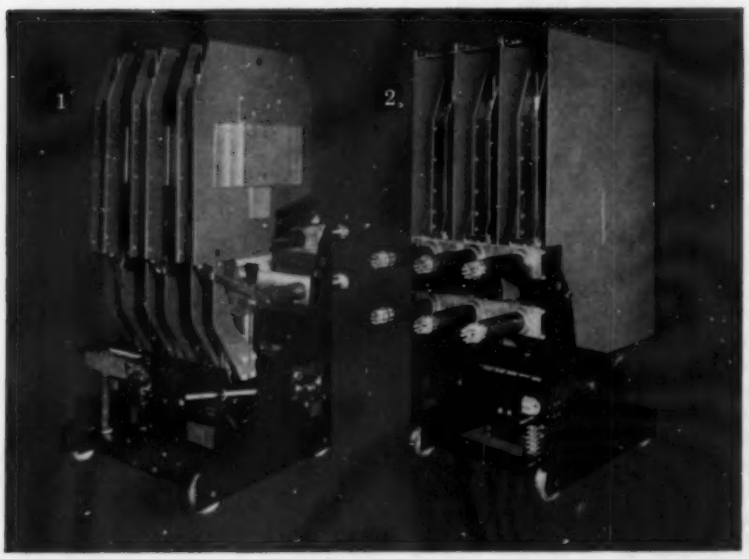
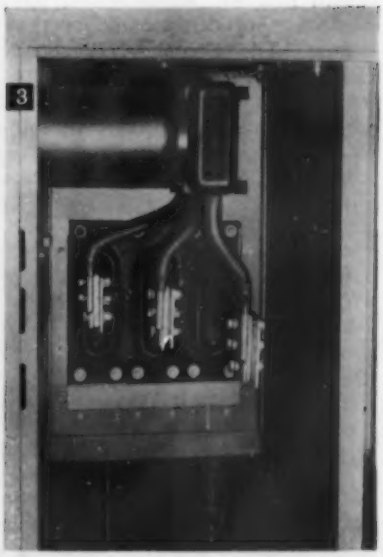


Completely assembled DH breaker, ready for installation in the metal-clad switchgear stationary structure.





Limitrak Insulation System is employed . . . **1** On DH breaker arc chute sides, end channels and supports. **2** On DH breaker bushings. **3** On bus supports of metal-clad switchgear housing. J-60975

For more facts circle 525 on Reply Card

PLANT ENGINEERS' DIGEST —so those who rush may read and know what's new

Edited by Marjorie E. Weissman

Sandwich-Core Makes Draped Shaped Production Tool That Is Easy to Handle, Store

PRODUCTION TOOLS can now be constructed with two or three layers of very thin glass laminate skins with a highly formable sandwich core. The core is unusual in that it can be draped in compound curves and is, therefore, useful for making composite tooling.

Large bulky tools made by this new method can be handled by one or two men. The all-plastic outer surfaces are resistant to damage by heat, cold, rain, sunlight and bruises that might be expected with repeated storage and reuse.

Flexible core is draped over mold. First laminate layer has already been applied.

Sandwich, complete with addition of second laminate layer, is pressure cured.

To build a tool, three or more layers of fiber-impregnated glass cloth are laid up on a mold, or master tool. Normal procedure for plastic laminating is observed, with either room-temperature-curing resins or pre-impregnated glass cloth being used to form the skins. The determining factors are the size of the part, type of mold or master tool being used and the type of equipment available for curing.

The sandwich core is bonded to the first skin while the skin is curing. Pressure is applied until the bond is made. Finally, additional layers of glass cloth are bonded to the top side of the core. Following the final cure the sandwich is complete and can be removed from the forming mold. *From Narmco Engineering Topics, published by Narmco Resins & Coating Co., Costa Mesa, Calif.*

Water Meters Help Control Tile Mix

FLUCTUATING WATER pressures and inaccurate water meter readings caused king-size headaches in the production of ceramic tile at the Pomona Tile Company, Pomona, California, according to D. O. Southwick, Plant Engineer. Extremely dusty operating conditions in the mill room aggravated the problem.

Plant Engineer D. O. Southwick checks readings on water meters that help control moisture content of ceramic tile mix.

Production of ceramic tile body material requires extremely accurate mixing cycles and consistent moisture content. The dusty workroom interfered with the operation of the water meter registers which required frequent maintenance.

To combat these conditions, two ⅝-in. water meters were installed. During the two years they have been in use, considerable savings have been made. These savings are credited to accurate metering and trouble-free operation.

Because of the accuracy of the meters, it was not necessary to spend $2,000 on an automatic moisture control system. One mixer unit was already equipped with such a system which accurately maintains the moisture control of the body material throughout the mixing cycle. The unit, however, was subject to slight inaccuracies due to the fluctuating water pressures.

This problem was solved by utilizing a 30-gal water supply tank mounted approximately 80 ft above ground level to provide a constant, 28-lb pressure reading.

Instead of installing a second automatic moisture control system, the existing system was connected to operate ahead of the second mixer. By matching the meter readings, the moisture content is controlled to within 0.003 per cent from one mixer to the other. *From the Rockwell Water Journal, published by Rockwell Manufacturing Co., Pittsburgh, Pa.*

Foundation Soil Inspection— By Television

AN INDUSTRIAL television camera housed in a shell made of Plexiglas acrylic plastic and steel is being tested as a tool for the inspection of soil formation beneath construction projects. The test site is in Boston, Mass.

The purpose of this camera is to inspect the character of the rock formation as much as 150 ft below the ground and then transmit the findings to viewing and recording equipment which is located on the surface.

Until recently it was common

(Continued on page 46)

adds greater value to CROUSE/HINDS EV Series explosion-proof lighting fixtures

Now, at no extra cost to you, this new Crouse-Hinds Prismatic Globe reduces troublesome glare while increasing "seeing" brightness. Provides more efficient working light, by softening and distributing the light evenly – without reducing the amount of usable light.

By eliminating "hot spots", the Crouse-Hinds Prismatic Globe reduces eye-fatigue . . . especially important in areas where reduced worker efficiency is itself a potential hazard. Prisms are inside the globe to keep the exterior dust-free. Prismatic Globes are furnished with 100, 150, 200/300 and 300/500-watt sizes of Crouse-Hinds EV Series explosion-proof lighting fixtures.

- **Reduces glare**
- **Gives uniform brightness**
- **Eliminates normal "hot spot" below fixture**

Crouse-Hinds Series EV Explosion-Proof Lighting Fixtures are easy to install and relamp, provide high lighting efficiency in areas classified as Class 1 hazardous by National Electrical Code. Available in choice of mountings, with a variety of reflectors for incandescent and mercury-vapor lamps.

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PLANT ENGINEERS' DIGEST

(Digest begins on page 44)

practice for construction companies to employ skilled inspectors to study rock formations beneath the earth's surface. The inspectors, outfitted in diving suits, were lowered into caissons sunk deep in the earth at the building site.

A surface study of core drillings could, of course, be made, but the construction company had to rely in large measure on the judgment of the inspectors as to whether the caissons had reached a formation that would support the building.

The new device provides a means whereby many engineers can study the underground formation from a surface location.

The shell housing the camera is suspended from a centering mechanism and rides up and down the caisson walls on two sets of ball bearing wheels. When the motor is started an operator on the surface can rotate the camera 360 deg in a horizontal plane, and 180 deg in a vertical plane, thus providing complete inspection.

Industrial television camera substitutes for human inspector, tells nature of soil formation beneath construction projects.

Since the function of the camera is to "see", it is essential for the material which houses the camera to be transparent.

Other requirements of the camera housing include strength sufficient to withstand hydrostatic pressure (which may be as much as 100 psi), and resistance to breakage on impact.

The shell was fabricated in two sections by William A. Crook Inc. of Watertown, Mass. The dome section, including the attachment flange, was formed from ½-in. thick Plexiglas. The cylinder was fabricated from ⅜-in. Plexiglas with a mitre joint, and a reinforced flange of ¾-in. Plexiglas was cement-bonded to each end. All flanges were drilled with holes for mounting.

Lighting is supplied by two newly-developed 150-watt projection bulbs mounted on the base of the camera so as to point always in the same direction as the camera. *From a release of Rohm & Haas Company, Philadelphia, Pa.*

Foamed Concrete Makes Lightweight Roof

Foamed, cellular concrete was used for incombustible lightweight roof at Los Angeles plant. Two inches of concrete was hosed onto 26-gage corrugated metal decking. (From This Earth, published by Permanente Cement Co., Oakland, Calif.)

Masking Hint

PAPER BAGS are being used at the San Francisco Naval Shipyard instead of paper and masking tape for masking valves, handwheels, instruments and other small components, to protect them during spray painting of equipment. The bags can be applied and removed more easily and quickly than tape. *From Bureau of Ships Journal, published by Navy Department, Bureau of Ships, Washington, D.C.*

Plant-Designed Gantry Welders

DESIGNED AND BUILT by the plant staff, two gantry welders are saving time and money in high precision welding operations at our Sheffield, Ala. missile plant.

All the basic equipment for girth welding is mounted on each gantry which straddles the aluminum shells being welded. The gantry welders move along common, but segmented, 180-ft tracks.

The shells are rotated by a series of perfectly matched friction driving shells along the floor track. This rotation and all welding operations are controlled by each operator and his console on the individual gantry welders.

Bolted construction was used in the framework, providing further flexibility. Extensions of the two upright columns and the crossbar unit can be adapted to larger diameter shells. Air and power are supplied to, and travel with, each of the two gantry welders by means of an overhead track and trolley system.

Before the installation of the first of the welders, it was necessary to tie up the girth welding unit for hours during the tedious and painstaking work of aligning the two

(Continued on page 48)

For more facts circle 527 on Reply Card

You find Gates Hose where anything flows. The Richardson "46" Motor Yacht, made by the Richardson Boat Company of Tonawanda, New York, uses Gates 19-B All Purpose Hose and Engine Coolant Hose on each of its twin marine engines.

Dependable Gates Hose makes for "cool" cruising

Whether it's for air, water, steam, oil or suction, there is a Gates Hose of the right type and size for the continued safe performance of all types of equipment—at sea, on land, or in the air.

Back of the world-wide acceptance of Gates Hose is a continuing program of specialized hose research at the multi-million dollar Gates Research Center. The aim of this program is to broaden the usefulness and lengthen the life of hose for all industries.

Distributors of Gates Industrial Hose are listed in the Yellow Pages of phone books in all major industrial centers. Performance of this product is guaranteed by the *World's Largest Maker of V-Belts.*

Gates Type 19-B Hose carries air, water, coolants, oils, greases, gasoline, kerosene, or solvents. This popular hose—one of many in Gates full line—is always available from your nearby Gates Distributor.

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Gates Industrial Hose

Made in a Full Range of Types and Sizes

"Call FOSTER... they'll ship Switch Material PLUS"

Right! L. B. Foster Company will ship switch material "*plus*" any standard rail section (new or relaying), crane rail and accessories, and track tools —everything you need, at lowest possible costs. Foster is your fastest, most dependable source for every rail and track item required for industrial sidings or in-plant trackage.

One more "*plus*": the advantage of lower freight rates from Foster's nationwide warehouses and stocking points. To help select materials best suited to your job, call the Foster Track Specialist.

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Faster From Foster
PIPE • PILING • RAIL

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PLANT ENGINEERS' DIGEST

(Digest begins on page 44)

skins, or shells, and placing heavy back-up bars.

The gantry welders make it possible to work as many as 10 different points along the track with the welder rolling into position only when the facing shells are fully prepared. Because the driving wheels for the shells can be disengaged in eight-foot sections, set-up and teardown work can be carried on while welding is in progress elsewhere on the tracks. *From a release of Reynolds Metals Company, Florence, Ala.*

First Aid Addition

Eye wash fountains, recent addition to our eye protection program, are operated by pressing forehead against metal disc. Water jets spray eyes, reduce possible injury. (From a release of Timken Roller Bearing Co., Canton, O.)

Non-Stick Coating

TO GAIN MAXIMUM economy, rubber-coated gasket material is wound into rolls containing several hundred yards of the material at the Vellumoid Company plant at Taunton, Mass. The rolls are then transported to Worcester, Mass., for fabrication into gaskets.

It was found that in unwinding the material at the Worcester plant, the surfaces would stick together, causing enough damage to make the material useless. Unless a satisfactory way could be found to roll the material for transportation, the entire process would have to be changed.

Synthetic rubber covered both

this patented

CLIP and STUD

makes LYON your BEST SHELVING INVESTMENT

Design makes the difference! Don't settle for less than the exclusive Lyon CLIP and STUD which many have tried to copy but none can duplicate. Fully protected by Government patents, Lyon CLIP and STUD obsoletes conventional steel shelving and guarantees you these *extra dividends*—

- ★ Easy, fast, low cost assembly.
- ★ Complete flexibility—shelves instantly adjustable from the front without use of nuts, bolts or tools.
- ★ Tremendous structural strength and rigidity.

Another extra dividend from Lyon—oldest and leading steel shelving manufacturer—an experienced Lyon Storage Engineer and Lyon Dealer as near as your phone—ready to help you save space, time, money.

There are many types of Lyon steel shelving. Above—a mezzanine (double decked) stockroom in which the lower installation supports the entire second floor. A big saver of valuable floor space.

LYON STEEL EQUIPMENT ®

OVER 1500 ITEMS

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491 Monroe Avenue, Aurora, Illinois

☐ I would like to see a Lyon CLIP and STUD demonstration.

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CITY_____ ZONE____ STATE_____

A PARTIAL LIST OF LYON PRODUCTS

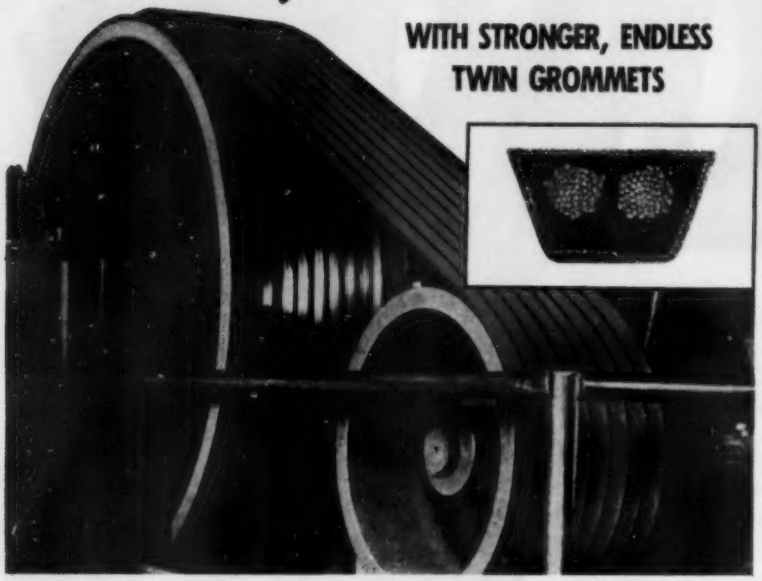
• Desks	• Storage Cabinets	• Bookcases	• Folding Chairs	• Sorting Files	• Tool Stands	• Cabinet Benches	• Display Equipment
• Tables	• Flat Drawer Files	• Coat Racks	• Service Carts	• Hopper Bins	• Tool Boxes	• Revolving Bins	• Hanging Cabinets
• Stools	• Drawing Tables	• Shelving	• Work Benches	• Drawer Units	• Parts Cases	• Toolroom Equip.	• Slotted Angle
• Lockers	• Filing Cabinets	• Bin Units	• Bench Drawers	• Shop Boxes	• Bar Racks	• Service Counters	• Wood Working Benches

For more facts circle 529 on Reply Card

GOODALL

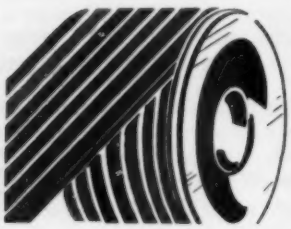
"PowerKing" VEE-BELTS

WITH STRONGER, ENDLESS TWIN GROMMETS



Try "Power-King" Vee-Belts—and note the savings they give through increased load-pulling capacity and efficiency.

The larger, stronger, continuous twin grommets permit the use of greater horsepower on the drive. Stretching is reduced—tension sustained. Belts last 20% to 50% longer.



FEWER BELTS PER DRIVE

Because each "Power-King" Vee-Belt exerts one-third more *gripping* power —more *driving* power—than an ordinary belt, *fewer* belts are required for any given load. Pulleys can be narrower, over-all weight less.

"If it's GOODALL, it MUST be Good!"

Contact Our Nearest Branch for Details and Prices

Standard of Quality—Since 1870

HOSE · BELTING · FOOTWEAR · CLOTHING AND OTHER INDUSTRIAL RUBBER PRODUCTS

GOODALL *Rubber Company*

GENERAL OFFICES, MILLS and EXPORT DIVISION, TRENTON, N. J.

BRANCHES AND DISTRIBUTORS THROUGHOUT THE UNITED STATES. IN CANADA: GOODALL RUBBER CO. OF CANADA LTD., TORONTO.

For more facts circle 530 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 44)

Graphite dispersion with anti-sticking properties is applied to gasket material.

sides of the gasket material and a dispersion with anti-sticking properties was sought to coat the rubber. A number of wax solutions and dispersions were tested but proved unsatisfactory. Then a dispersion of graphite in mineral spirits was applied with a standard knife coating head to the synthetic rubber on both sides of the material, after partial curing of the rubber. Following the application, the curing process was completed. The dispersion is thinned with petroleum naphtha, used in the ratio of seven parts of the solvent to one part dispersion.

With use of this solution, rolls can be quickly unwound without damage. *From a release of Acheson Colloids Co., Port Huron, Mich.*

"Clean Area" Is Really Clean

ELECTRONIC TUBES used in missiles are being manufactured in an area as clean as a hospital operating room at our power tube plant in Scranton, Pa.

The area, sealed off from the rest of the plant and painted white to facilitate daily cleaning, is supplied with filtered air to keep out dust, lint and other foreign matter. The filtering system completely changes the air in the area every six minutes and removes particles as small as 1/10 of a micron. Relative humidity is maintained at 35 per cent.

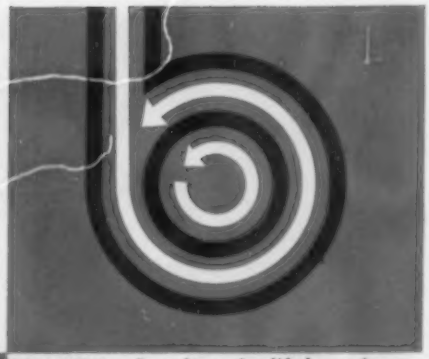
Access to the area is through a double-air-lock. Production workers have their shoes vacuum brushed in the first air-lock, then pass to the

From Dustex . . .

another revolution in dust collection . . .

DUSTEX ROTO-JET CLOTH COLLECTOR

where cloth is the RIGHT answer . . .
Dustex engineering eliminates usual cloth problems
drastically lowers operating and maintenance costs



1. Torque tube and cleaning air duct
2. Support roller under cloth
3. Blow tube
4. Wrap control roller
5. Drive motor

DUSTEX PATENTED FEATURES ARE THE BASIS FOR DUSTEX SUPERIOR PERFORMANCE

It will pay you to learn why Dustex has so successfully handled so many process dusts where other collectors have failed.

NO REVERSING MECHANISMS — Ingenious, simplified, continuous cleaning action in operation.

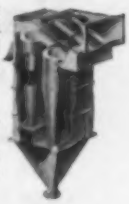
NO CLOTH JAMMING — Unique controlled wrap of cloth around blow tube eliminates cloth jamming . . . maintains constant, low friction that requires less driving torque and power.

CLOTH CHANGES EASIER . . . LESS FREQUENT — Dustex Roto-Jet principle keeps cloth cleaner during operation. Gentle, free roller action prolongs cloth life. Easy access simplifies changes when required.

WHERE CENTRIFUGAL COLLECTION IS THE RIGHT ANSWER DUSTEX PATENTED FEATURES PAY FOR THEMSELVES

DUSTEX MINIATURE CYCLONES
D-584 with 100% efficiency at 14 microns
D-560 with 100% efficiency at 12 microns
for economical separation of dust from normal or high temperature gas or air.

MICROCLONE with 99.8% efficiency at 10 microns and smaller for ultra-high efficiency and strict sanitation . . . easily cleaned and sanitized thanks to convenient hinged top tube sheet design.



For Many Ordinary Dusts New, Low-Cost DUSTEX "1600" brings higher Dustex Performance to collectors in Lower Price Range.

THE BIG DIFFERENCE — DUSTEX EXCLUSIVE PATENTED DESIGN
Unobstructed inlet plenum avoids material buildup and plugging.
All tubes are surrounded by cleaned gases and maintained at system temperature to forestall condensation and plugging when systems gases are above dew point.

FOR ALL HOPPER AND BIN DISCHARGES (Under Negative Pressure)
DUSTEX VACUUM VALVE—No motive power required . . . No mechanical parts . . . Maintenance free . . . Bolt in place and forget it.

ON THE JOB DETERMINATION TEST YOUR BEST GUARANTEE
The Dustex Single Tube Determination Test, performed under your actual operation conditions, provides you with exact data required to select the proper Dustex Collector for your plant. No cost or obligation.

SEND FOR "A Simplified Test Method," illustrated booklet describing the Dustex Single Tube Determination Test in detail.

Details and specifications for every model available on request.

dustex CORP.

The company with the big name in dust collection

DUSTEX CORP. • P.O. Box 2520 • Buffalo 25, N. Y.

For more facts circle 531 on Reply Card

"...our fence definitely discourages pilferage..."

SAYS EAST COAST BOTTLING COMPANY

"When this new soft drink plant went up in the fall of 1959, 700 feet of Anchor Fence were installed at the same time. The architect specified chain link for its durability and maximum protection features. The contractor selected Anchor Fence after competitive pricing. Our Anchor Fence prevents trespassers from short-cutting through the property and definitely discourages pilferage from trucks left in the yard overnight. The sliding gate is very valuable in helping us avoid traffic tie-ups."

Call your local Anchor office today for a talk with one of Anchor's trained sales engineers. Write for free catalogue to: ANCHOR FENCE, 6661 Eastern Avenue, Baltimore 24, Maryland.

ANCHOR FENCE

Division of ANCHOR POST PRODUCTS, INC.®

Plants in Baltimore, Md.; Houston, Texas; and Whittier, Cal. • Sold direct from factory branches in all principal cities.

For more facts circle 532 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 44)

second where they change into lint-free smocks before entering a closed corridor leading to the work rooms.

The area is pressurized so that any dust which penetrates the complex air-lock system will not be able to enter a work room when a door is opened.

The assemblers, in addition to lint-free uniforms, wear hair covering and plastic finger guards to protect parts against moisture and skin oils.

Part of controlled atmosphere area where tubes for missiles are assembled.

All materials brought into the assembly area are pre-cleaned and stored in covered plastic containers. *From a release of General Electric Co., Schenectady, N.Y.*

Quick Blast Furnace Repairs

DURING A RECENT inspection of a blast furnace, it was found that the top 16 ft of the furnace had lost its steel wear plates which protect the brick lining, and had also lost some of the lining itself.

Because of the urgent need of getting the furnace back into service quickly, the furnace wall was relined by an unusual technique: spraying the damaged area with a thick coat of a high strength, pneumatically applied, castable refractory material.

To carry out the repair, the gases inside the furnace were sealed off by pouring a convex concrete cap, 8 in. thick, over the coke burden. This also gave workers a solid footing and a base for erecting scaffolds. The worn lining was next sandblasted to produce a clean surface,

made with
WEATHER-RESISTANT
PARAPLEX® P-444
acrylic-polyester resin

Look for the label that assures

WEATHER-RESISTANCE

This label stands for *unmatched weatherability* among glass-fiber reinforced panels, because it signifies that the panel is made with PARAPLEX P-444 acrylic-polyester resin. Years of Rohm & Haas research on many types of resins for reinforced panels have established that the best weather resistance is achieved by a combination of acrylic and polyester resins. PARAPLEX P-444 represents the most effective combination for imparting outdoor durability, *plus* pleasing appearance, high strength, excellent light transmission, and easy installation. Only Rohm & Haas supplies this proper combination, in PARAPLEX P-444. We will be glad to send you the names of panel manufacturers.

Chemicals for Industry

ROHM & HAAS COMPANY

WASHINGTON SQUARE, PHILADELPHIA 5, PA.

PARAPLEX is a trademark, Reg. U.S. Pat. Off. and in principal foreign countries.

PARAPLEX P-444

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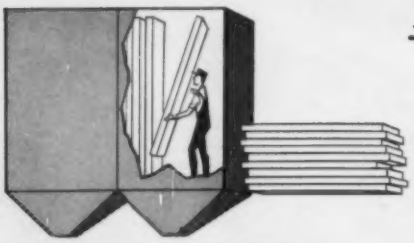
SINCE 1874 SLY

SLY DUST FILTERS For ACCESSIBILITY

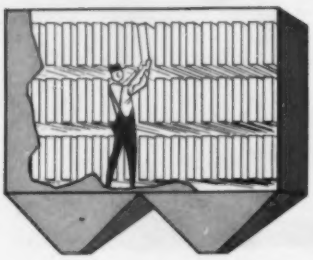


1900's
SLY DUST ARRESTER

Every cloth screen from the end of the arrester had to be removed to reach the faulty screen.

1930's
SLY TUBE-TYPE FILTER

To replace a tube required at least partial disassembly of every other tube in the way.



TODAY
NEW SLY
"ROLL-CLEAN"
DYNACLONE®

Any filter bag is easily accessible and can be replaced without need for removing others.

NEW SLY DYNACLONE PROVIDES FASTEST, EASIEST BAG CHANGING

Whether you change one bag, or the entire filter, you do it in less time with the Dynaclone. Quick replacement of individual bags eliminates the need for costly rebagging should only a few be worn. Complete change is also fastest . . . the Dynaclone has only one half as many bags as other filters with the same cloth area. In addition . . .

New "Resist-O-Wear" bags offer 200 to 300% more bag life.

The Dynaclone operates continuously. It provides complete dust suppression through constant suction.

The Dynaclone is automatically self-cleaning by reverse air. A single exhaust fan provides *both* suction for dust collection and air for bag cleaning. No auxiliary blowers required.

And the Dynaclone provides 20 to 40% more cloth in a given space than other makes of dust filters.

The Dynaclone has been proved in more than 1,000 installations. Investigate its advantages on your applications . . .

SEND FOR 36-PAGE CATALOG 104

THE W. W. SLY MANUFACTURING CO.

4600 Train Avenue • Cleveland 1, Ohio • Offices in Principal Cities • Overseas Licensee: Andrew Air Conditioning Ltd., London S. W. 1, England

For more facts circle 534 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 44)

Blast furnace was relined by spraying castable refractory onto furnace wall.

and finally two hoses, delivering 70 psi, applied the refractory material to a thickness varying between 20 and 33 in. The job took five days.

The technique of spraying walls in blast furnaces has been used to some extent by other furnace operators, but the practice of sealing off the coke burden with a concrete cap was experimental. *From a release of The Colorado Fuel & Iron Corp., Pueblo, Colo.*

Quick Bath for Stack

New method of cleaning paint stack uses water line inside, connected to ring at top which allows water to wash down inside surface. The operation is controlled by valve at base of stack. Formerly stack was washed down by hand. (From a release of Ryan Aeronautical Co., San Diego, Cal.)

SAVE SPACE

WITH NEW GENERAL ELECTRIC SAFETY SWITCHES

Lugs for either copper or aluminum wire (60 to 600 amp.).

Bottom-hinged and front-operated for close ganging.

Visible blades are spring-reinforced to assure full, firm contact; minimum joints in current path; silver-plated copper parts; no fiber linkages in mechanism.

Clear ON-OFF indication from over 100 feet. Ratings plainly shown on permanent metal nameplate.

HEAVY DUTY ▲

▼ LIGHT DUTY

Safety phase barriers guard against accidental contact with live parts.

General Electric's new safety switches bring you important savings in space, longer service life, maximum safety and more economical installation. And Heavy Duty (Type A) switches sell at Normal Duty (Type C) price levels. Write for Bulletin CPD-74. See your nearest G-E distributor for a demonstration.

GENERAL ELECTRIC

Circuit Protective Devices Dept., Plainville, Conn.

For more facts circle 535 on Reply Card

As functional as it is attractive . . .

New H. J. Heinz research center is another endorsement for Transite® Vent Pipe!

Architects and Engineers:
Skidmore, Owings & Merrill
Partner in Charge: Gordon Bunshaft
Consultants on Mechanical Engineering: Jaros, Baum & Bolles
General Contractors:
George A. Fuller Company

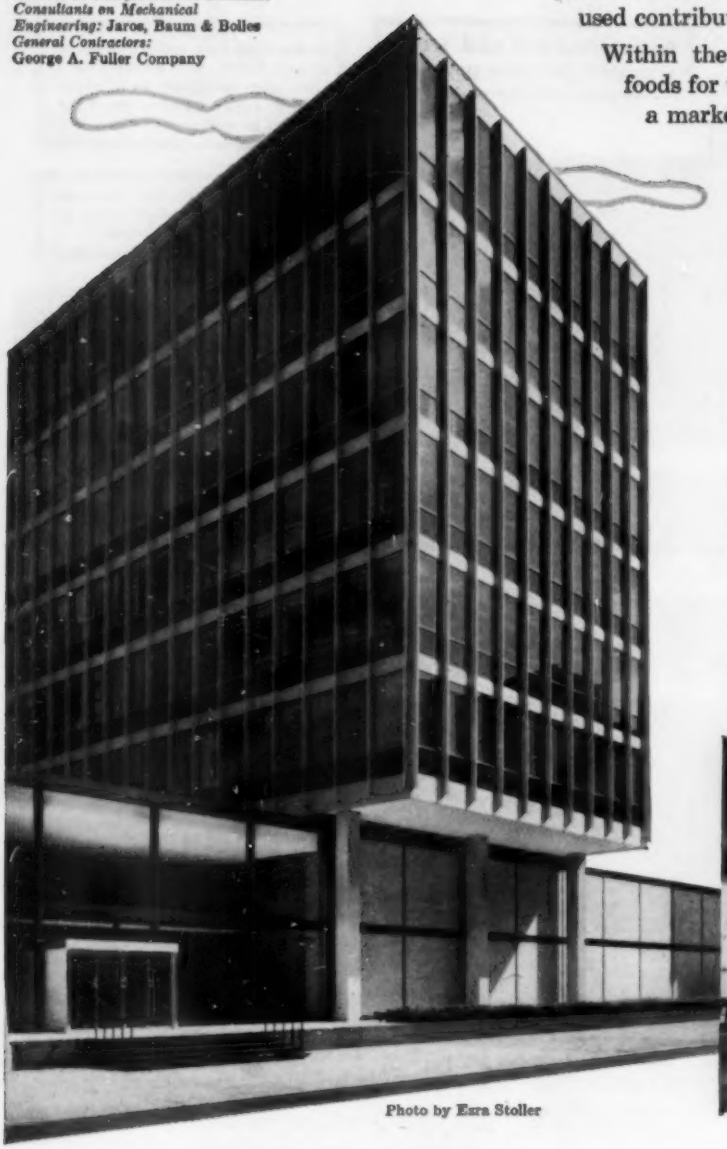


Photo by Ezra Stoller

Visit the H. J. Heinz Company's new Research Center and you see a strikingly attractive structure . . . *and every bit as functional!* Here—every design detail, every material used contributes to greater scientific productivity.

Within the many laboratories—equipped to test foods for taste, aroma, color, appearance—there's a marked accent on cleanliness. Every piece of equipment is planned to prevent contamination, to stay clean and rust free. That's why corrosion-resistant Transite Industrial Vent Pipe was chosen to vent every one of the Research Center's laboratories.

Whether used indoors or out, Transite offers you many advantages. Made of asbestos-cement, Transite retains its original, attractive appearance. *Saves on upkeep* because it never needs painting or preservative coating. *Saves on maintenance* because it resists the attack of most gases, mists, fumes and dusts . . . is unaffected by weather.

For further information on Transite Industrial Vent Pipe, write to Johns-Manville, Box 14CO, New York 16, N. Y. In Canada, Port Credit, Ontario.

JOHNS-MANVILLE

JOHNS-MANVILLE JM PRODUCTS

For more facts circle 536 on Reply Card

Alan Wood Super Diamond floor plate sheds dirt and water quickly

Sweep it, hose it or mop it—A. W. Super Diamond rolled steel floor plate has no pockets to hold dirt or water. The perfectly designed pattern of Super Diamond makes it the easiest-cleaning floor plate on the market today. You can shear, form, weld and match this floor plate wherever necessary, and the unique arrangement of the pattern allows you to bend it any place.

Super Diamond has many other advantages, too . . . an easily matched well-known design pattern . . . and readily available from warehouses. It wears indefinitely, with no chipping, cracking or splintering. And feet get traction from *every* direction, even when plates are wet.

For safety . . . for easy installation . . . for long wear . . . specify Alan Wood Super Diamond. Write for Bulletin SD-S3.

ALAN WOOD STEEL COMPANY

CONSHOHOCKEN, PA.

DISTRICT OFFICES AND REPRESENTATIVES: Philadelphia • New York • Los Angeles • Boston • Atlanta Cincinnati • Cleveland • Detroit • Heuston • Pittsburgh • Richmond • St. Paul • San Francisco • Seattle Montreal, Toronto and Vancouver, Canada: A. C. Leslie & Co., Ltd.

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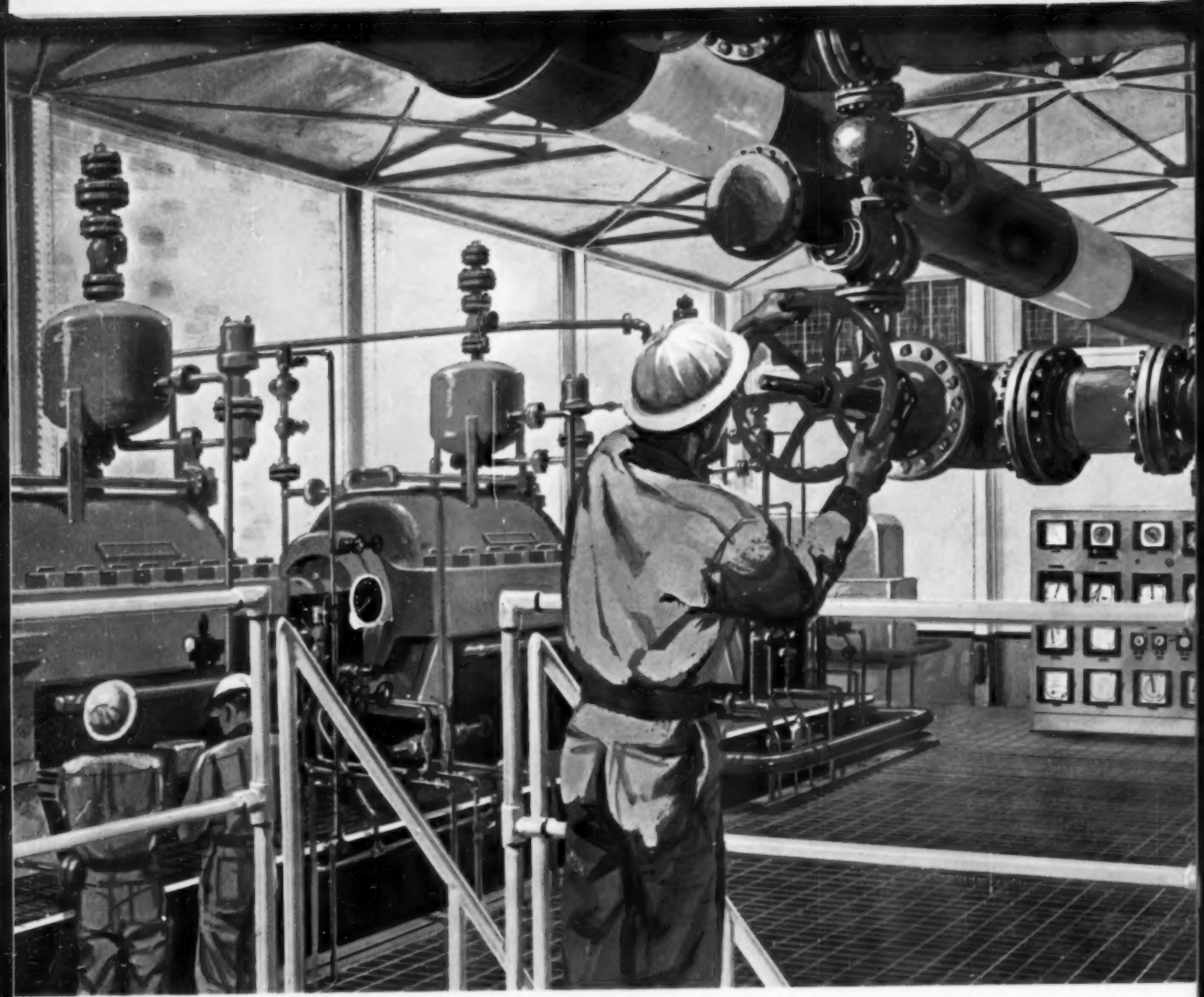
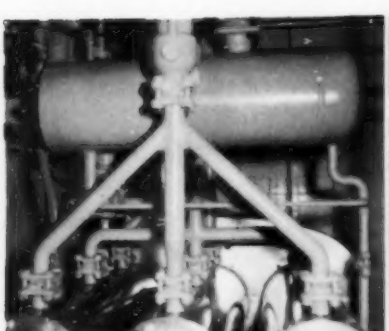
For more facts circle 538 on Reply Card ⟶





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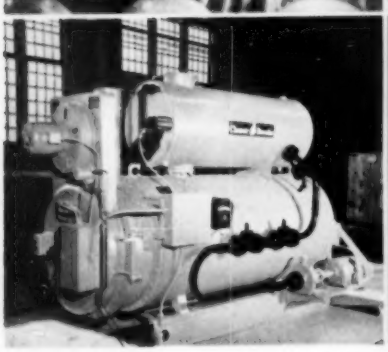

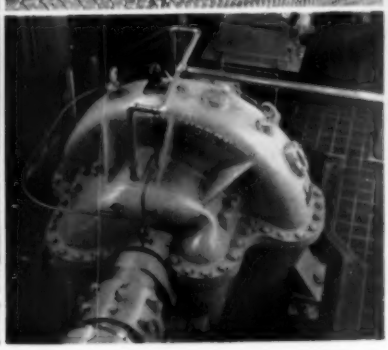

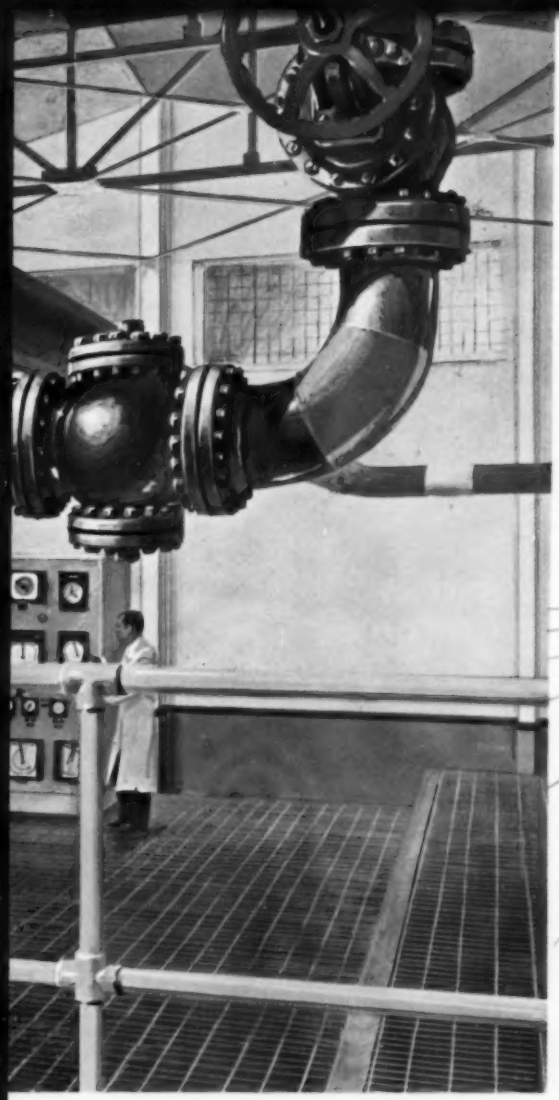

Rust-Oleum

NEW COLOR HORIZONS

System

HERE is a modern, functional *system* that combines four important points. (1) the ability to stop rust, (2) modern color harmony, (3) durability to last and last, (4) ease of application. From machinery, equipment, and structural steel to tanks, steel fences and metal sash – the Rust-Oleum New Color Horizons System can provide lasting beauty in the colors of your choice. Ask your Rust-Oleum Industrial Distributor, together with your Rust-Oleum Factory Specialist, to make a survey of your plant and provide complete recommendations. Rust-Oleum Industrial Distributors maintain complete stocks for prompt delivery in all principal cities of the United States, Canada, and in many countries around the world.

Rust-Oleum, in its various forms, can also save you time and money on problems like these: Heat Resistance, Water Resistance, Chemical Resistance, Coating Galvanized Metal, Speedy-Dry Coatings (less than thirty minutes to dry).

PROVED THROUGHOUT INDUSTRY FOR OVER THIRTY-FIVE YEARS

RUST-OLEUM®

See our catalog in Sweet's.

STOP RUST by applying Rust-Oleum 769 Damp-Proof Red Primer directly over the sound rusted surface

Save time, money, and metal. Brush Rust-Oleum 769 Damp-Proof Red Primer right over the remaining sound rusted surface after scraping and wirebrushing to remove rust scale and loose rust. **Specially-processed** fish oil vehicle penetrates rust to bare metal as proved in radioactive tracing studies.

STOPS RUST!®

Distinctive as your own fingerprint. There are imitations, but only one Rust-Oleum.

Insist upon industry-proved Rust-Oleum. Accept no substitute.

You take the brush! Try a free test sample!

ATTACH TO YOUR LETTERHEAD

RUST-OLEUM CORPORATION
2985 Oakton Street • Evanston, Illinois

At no cost or obligation, please send me:

- ☐ New full-color catalog on New Color Horizons System and specialized Rust-Oleum systems, including color charts and applications.
- ☐ FREE TEST SAMPLE of Rust-Oleum 769 Damp-Proof Red Primer.
- ☐ Please have your representative contact us to discuss a plant survey.

Rubber is reduced to "crumb" for subsequent drying operation.

JEFFREY DISINTEGRATORS

save time in processing rubber

Jeffrey disintegrators quickly rip and tear slabs of wet synthetic rubber into small sized chunks for efficient drying and melting.

The disintegrators shred rubber slabs to "crumb" size of minus 2" to plus ¼" in one operation. These Jeffrey units have an excellent service record with low maintenance demands.

Jeffrey machines can reduce a wide range of materials, whether soft or hard, to the size you want. The Jeffrey Manufacturing Company, 905 North Fourth Street, Columbus 16, Ohio.

JEFFREY

CONVEYING • PROCESSING • MINING EQUIPMENT...TRANSMISSION MACHINERY...CONTRACT MANUFACTURING

For more facts circle 539 on Reply Card

It's a fact, when you switch to
Cleco No. 10 Series drills • screwdrivers • nut-runners
PRODUCTION GOES UP • PRODUCT QUALITY IMPROVES • OPERATING COSTS GO DOWN

Here's why:

Reduce parts inventory. By using identical parts throughout the series (where feasible), and by designing the tools with built-in interchangeability features, Cleco has made it possible for you to *simplify and reduce parts inventory.*

Cost less to operate. No. 10 Series motors are more powerful, yet actually require less air per h.p. output. Well-balanced, and easy-to-handle, these tools are constructed of heavy duty material (high quality Ni, Cr, Mo alloy steel pinion and planet gears, for example) that can really take the demolishing punishment of high production operations. Friction-free clutch permits longer, *much longer* periods of maintenance-free operation.

Speed production, while improving quality control. No. 10 Series Drills and Screwdriver—Nut-Runners have design features that reduce time lost and rejects. *No. 10 Drills:* are equipped with 3-idler planetary gear trains for all gear reductions; have a low noise level; and develop ⅓ h.p. Drill speeds range from 500 to 20,000 r.p.m. *No. 10 Screwdriver*—Nut-Runners are available in speeds from 500 to 5,000 r.p.m. Equipped with a no-drift locking device, No. 10 Screwdrivers have unequaled torque holding ability. They cannot over-torque, strip threads, crack plastic, or damage screw heads.

You will not believe that these tools could possibly have so many positive advantages until you see them for yourself, so contact your local Cleco® representative for a no-obligation demonstration. For specifications and literature, write:

CLECO
AIR TOOLS

A Division of REED ROLLER BIT COMPANY
P. O. BOX 2119 • HOUSTON 1, TEXAS, U.S.A.

IN CANADA: Cleco Pneumatic Tool Company of Canada, Ltd., 927 Millwood Road, Leaside (Toronto), Ontario

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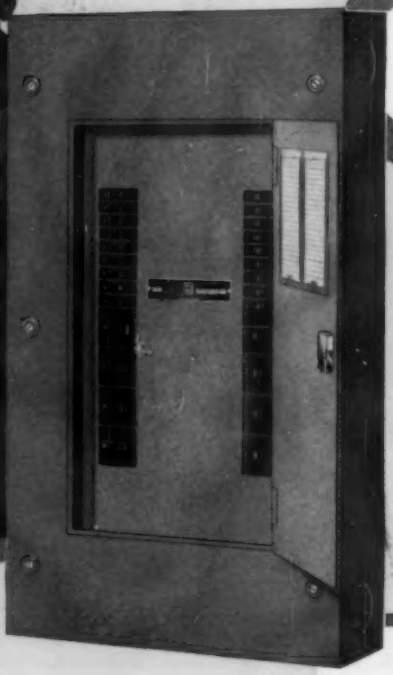
SAVE- space time money

Same PANELBOARD LIGHTING AND

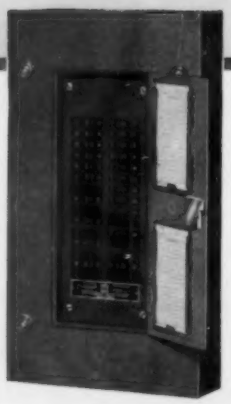


Heavy Duty Construction!

NQO Panelboard

400 or 600 amp Mains

• Why waste time, space and money by installing separate lighting and power panelboards? Square D now makes it easy to combine 120 and 240 volt lighting and power loads up to 100 amperes, into one panel. Equally important, thanks to plug-in design and a complete range of circuit breakers (*see opposite page*), you can get a real heavy duty industrial type panelboard with exactly the circuits you need—right out of your Square D distributor's stock.*



100 or 225 amp Mains

*NBQ (plug-in) and NQOB (bolted connection) panelboards are also available factory-assembled for shipment direct to the job

SQUARE D COMPANY

COMBINES *Both* POWER LOADS!

FINEST BREAKER EVER BUILT!

THE QO FAMILY

QO 1-POLE 15-50 Amp	QO 2-POLE 15-70 Amp	QO 3-POLE 15-50 Amp	Q1 2-POLE 70-100 Amp	Q1 3-POLE 70-100 Amp

D ... *design leadership* FEATURES

- Complete flexibility. Plug-in circuit breakers available up to 100 ampere three-pole in any arrangement.
- Distributed phase bussing—reads like a wiring diagram. Two and three-pole breakers may be mounted anywhere in the panelboard.
- Plenty of wiring room. 5" end gutters with 100 and 225 ampere mains; 8" end gutters with 400 and 600 ampere mains.
- Quality lugs throughout. Approved for aluminum or copper wire.
- Heavy duty enclosure. Galvanized steel boxes, full finished trim with a solid door.
- *Qwik-Open* feature of lighting breaker prevents damage due to high resistance or "arcing" faults.
- Ambient temperature compensation prevents nuisance tripping in high temperatures.
- Trip indication tells instantly whether circuit has been turned off intentionally or has "tripped."
- Temperature-compensated — prevents nuisance tripping.
- Common trip prevents single phasing or personal injury.
- Single handles on two and three-pole breakers for modern, streamlined appearance.
- Plated jaws and connectors assure positive connections.
- Heavy duty industrial quality for long life and trouble-free operation.

Write for the complete story
Address Square D Company, 1601 Mercer Road, Lexington, Kentucky

wherever electricity is distributed and controlled

For more facts circle 541 on Reply Card

OPERATION AND PRODUCTION —pointers for the industrial plant engineer

Edited by Vern Kempf

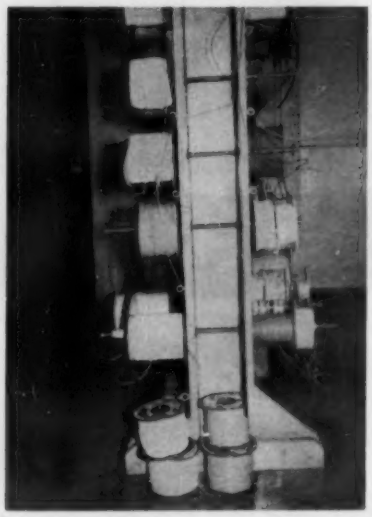
Reel Rack Shows Wire Inventory

By Ken BIDDLE, Plant Engineer
Sunstrand Aviation, Rockford, Ill.

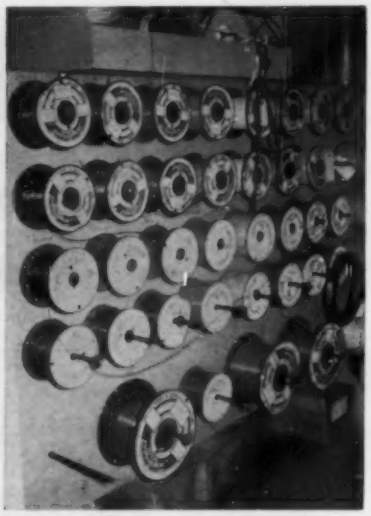
THIS simple wire rack has solved two problems common to the handling of many small reels of wire. One is the problem of inventory. Frequently different sizes get mixed up and stock may be entirely used up before the mixup is discovered. With the new rack, the entire inventory is easy to see and check for sizes needing replacement.

Secondly, each reel is usually moved from storage to a wire measuring device and then back to storage. Now the wire is threaded through a screw-eye on the end of the rack and then directly into the measuring machine. The reel stays in its place on the rack throughout the entire operation, saving a great deal of time.

The rack is made of wood, braced as shown with iron rods running through front and back to act as spindles for the reels. The rods are drilled to take cotter pins and washers between the boards to prevent the rods from pulling out. Additional cotter pins and washers are used on the ends of the rods to secure the reels. The screw-eyes serve as guides when paying out the wire. Additional guides can be installed if desired.



End view of storage rack showing details of construction and spindles.



Holding 100 reels, rack permits fast inventory and selection of any wire.

Induction Heat Reduces Rejects

PROBLEMS of reworking brazed carbide tips on router bits and saw teeth for woodworking tools have been eliminated by the Virginia Machine Tool Company, Bassett, Va., with the use of an electronic induction heater. Equipped with a variable coupling output transformer, the company is able to match the heater to the output coil instead of designing and forming an output coil to meet the fixed outputs of the heater.

Close-up of brazing operation on a 12-in. diameter circular saw. Carbide tip, at end of pointer, is brazed to the saw tooth in approximately 45 seconds.

In the past, carbide tips were brazed to bits or saw teeth with heat from a small oxyacetylene torch fitted with different-sized nozzles. A uniform brazing temperature over the area to be worked was almost impossible to achieve resulting in stress and eventual cracking of the carbide tips.

Using an electronic induction heater, manufactured by General Electric's Industrial Heating Department, the total time cycle for brazing a saw tooth has been reduced to 45 seconds. The saw blade is placed horizontally on a jig with an anvil placed directly under the saw teeth. Soldering flux is applied to the teeth and one loop of copper tubing is attached to the induction heater and is brought close to the tooth to be worked.

A carbide tip is placed against the tooth and rested on the anvil. At this point the heater is turned on and reaches maximum heat within 25 seconds. It is held at maximum heat for 10 seconds, turned off, and the tooth permitted to cool for 10 seconds before turning the saw to the next tooth.

The new induction heating equipment reduces the average production cycle by about 30 per cent over the previously used oxyacetylene torch. In addition the uniform heat obtained results in higher quality and reduces the amount of re-work formerly required to produce satisfactory saws.

Radio Saves Time Finding Men

MICROWAVE RADIO is used to provide immediate contact with key personnel scattered throughout gi-

(Continued on page 66)

SETTING
NEW STANDARDS
OF PERFORMANCE...
Another
LUNKENHEIMER
FIRST!
THE
LQ600®
VALVE
FIG. LQ600-200
200 lb. S.P.—550°F.—
400 lb. W.O.G.
FIG. LQ600-150
150 lb. S.P.—300 lb. W.O.G.
¼ to 2 inches
Long-accepted valve maintenance costs have been sharply reduced in thousands of plants where LQ600 Valves are in service. Their patented Brinalloy® seats and discs are more resistant to wear and corrosion than 500 Brinell Stainless Steel . . . even outlast case-hardened Stainless Steel exceeding 1000 Brinell. LQ600 Valves practically eliminate maintenance costs . . . another big reason why you can't find the cost of a valve on a price list!
SEE YOUR LUNKENHEIMER DISTRIBUTOR
or write for literature
THE LUNKENHEIMER CO., CINCINNATI 14, OHIO
LUNKENHEIMER®
THE ONE Great NAME IN VALVES
L-496-28R

For more facts circle 542 on Reply Card

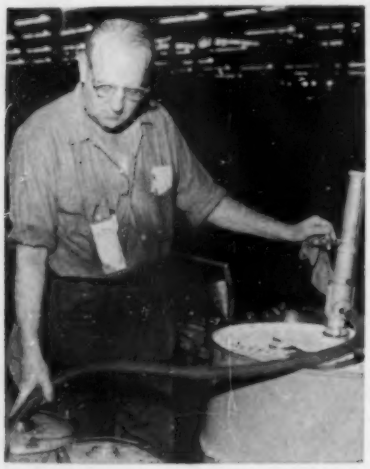
OPERATION — PRODUCTION

(O and P begins on page 64)

ant industrial plants. The compact device, worn clipped to a shirt pocket, has proved to be a success at the 30-acre Chrysler Corporation Mound Road Engine plant.

A buzzing sound emits from the device whenever the central control office desires to talk to the maintenance man wearing the unit. A small light shines brightly on top of the unit to attract his attention should he be in an area where machinery noise level is high. When the man is alerted by the radio unit, he finds the nearest in-plant telephone and calls central control for instructions.

Capable of operating at distances up to several miles, the microwave units furnished by the Stromberg-Carlson Corporation have frequent-



Radio, clipped to shirt pocket, tells maintenance man when he is needed.

ly proven their worth in emergency service to presses and electrical panels. The units are assigned to key maintenance men who must roam the plants to service various machines.

Contact Gaging Speeds Work

GAGING of reinforced plastic nose cones and radomes at Brunswick-Balke-Collender Co., Marion, Va., used to take several days. With ultrasonic equipment, however, the same job takes only a few hours.

Nose cone of Bomarc missile is shown here receiving a final thickness check by means of an ultrasonic resonance gage. As the gage requires access to one side, thicknesses of a nose cone may be checked quickly and accurately.

This impressive saving in time is due to the use of resonance gages made by Branson Instruments, Inc., Stamford, Conn. At Brunswick, two of these units are used to check exacting dimensions of reinforced plastic nose cones and radomes and have noticeably speeded completion of top-priority defense projects.

Formerly, separate checking fixtures had to be built for each different component. Parts were frequently measured, re-shaped and repositioned on the fixture. Now, thickness is read directly on a calibrated scale, without removing the nose cone from its mandrel or mold. Because of the instrument's speed and reliability, a two-man team can measure the 4000-plus check points of a B-58 nose radome in less than a day.

Accuracy of the gage is guaranteed to within 1.0 per cent of actual thickness over a wide scale range and measurements to within 0.001 in. are routinely possible. At Brunswick, thicknesses usually range from 0.020 to 0.5 in. Several times daily, the gage is quickly recalibrated on a piece of plastic of the same composition as that of the cone under test. Checks with micrometers have consistently confirmed the reliability of the instrument.

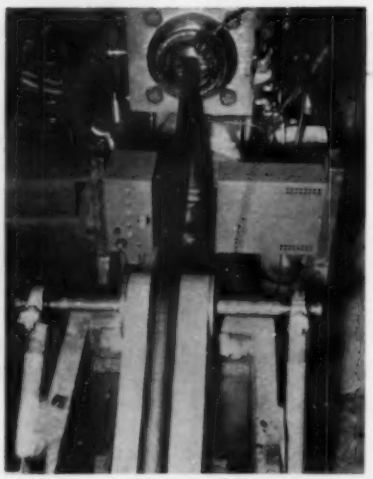
Operation of the gage is simple and a semi-skilled operator obtains consistent and reliable results with only a few hours of instruction. A continuously varying frequency, produced by an electronic sweep oscillator, is changed into mechanical vibrations by the transducer and transmitted into the plastic.

At certain frequencies, characteristic of the type and thickness of the material under test, harmonic resonances are set up which appear as one or more traces on the cathode ray tube. By placing suitably calibrated scales in front of the tube, thickness can be read directly.

Control Solves Dip Problem

SUCCESSFUL adaptation of equipment originally developed for military use enabled the Armstrong Cork Company to solve a major problem in the production of Armaflex, a flexible foamed plastic pipe covering.

In producing the tubular insulating material, difficulty was encountered in maintaining a constant



Silicon diodes control dip in product between extrusion machine and conveyor.

quantity of material in a free dip between the extrusion machine and the take-away conveyor. The extreme plasticity of the material made the free-hanging dip essential and also precluded any mechanical device to sense the dip level.

Adjustable speed control had been furnished for the take-away conveyor but variations in extrusion rate made adjustment of conveyor speed a full time job for the operator. The problem was solved by using multiple groups of silicon di-

For more facts circle 543 on Reply Card ——→

Allis-Chalmers uses **RYKON** *Grease in bearing shield —offers farmers better disc harrow*

Situation: Bearings of a disc harrow in service are always turning in dusty conditions, oftentimes completely covered with soil. Such bearings in the Allis-Chalmers harrow are protected with grease-coated rubber shields. The grease guards against dirt getting past the shield and into the bearing.

What was done: Allis-Chalmers project engineer in the LaCrosse, Wisconsin plant, Maynard Walberg, called Fred Parkinson, Standard Oil lubrication specialist, for a sample of RYKON Grease. In conditions simulating field service, RYKON Grease was tested. Bearings were rotated in the most abrasive dirt available—Mississippi sand with a high quartz fraction.

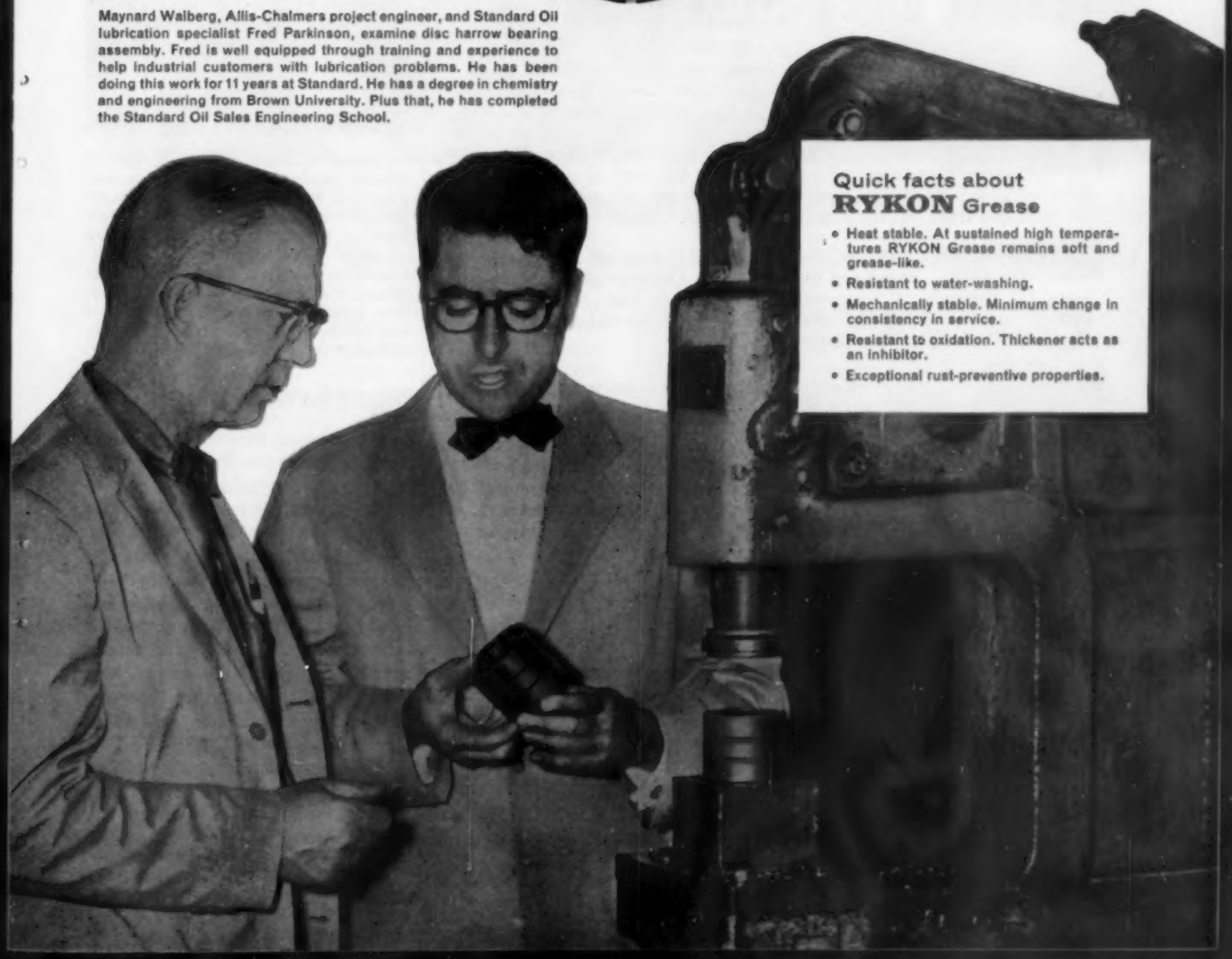
What happened: Tests were started and run to destruction. Prior to the use of RYKON Grease, bearing failures occurred at 500 hours. On switching to RYKON Grease, these tests were pushed to 2,000 hours. At this point, tests were stopped. Bearings were still in operating condition.

What you can do: Find out how RYKON Grease might help you offer your customers a better product. Inquire of the Standard Oil lubrication specialist nearest you anywhere in the 15 Midwest or Rocky Mountain states. Or write **Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.**

Can RYKON Grease help you improve your product?

You expect more from STANDARD *and you get it!*

Maynard Walberg, Allis-Chalmers project engineer, and Standard Oil lubrication specialist Fred Parkinson, examine disc harrow bearing assembly. Fred is well equipped through training and experience to help industrial customers with lubrication problems. He has been doing this work for 11 years at Standard. He has a degree in chemistry and engineering from Brown University. Plus that, he has completed the Standard Oil Sales Engineering School.



Quick facts about RYKON Grease

- Heat stable. At sustained high temperatures RYKON Grease remains soft and grease-like.
- Resistant to water-washing.
- Mechanically stable. Minimum change in consistency in service.
- Resistant to oxidation. Thickener acts as an inhibitor.
- Exceptional rust-preventive properties.

BELMONT

Ajax Spiralwound
FLANGE and BOILER GASKETS

No waiting for the popular types and sizes of spiralwound flange and boiler gaskets. Belmont backs their Distributors in 132 key industrial areas with stocks on hand for immediate shipment.

TYPE SR with steel centering ring for raised face, Van stone and lapped joints. All nominal pipe sizes from ½″ through 24″ in pressure ranges from 150 psi through 600 psi; and from ½″ through 12″ in pressure ranges to 2500 psi.

TYPE H with loop centering guide for raised face, Van stone and lapped joints. All nominal pipe sizes from ½″ through 24″ in pressure ranges from 150 psi through 600 psi (except 400 and 600 psi gaskets above 8″, for which services Type SR Gaskets are stocked).

TYPE MH and CR Boiler manhole gaskets in 3 pressure ranges—to 499 psi, to 999 psi and 1000 psi and above. Sizes 11″ x 15″ and 12″ x 16″ in flange widths from ¾″ to 15/16″.

TYPE A for boiler handholes and tube caps in 3 pressure ranges—to 499 psi, to 999 psi and 1000 psi and above. Most popular sizes for Babcock & Wilcox, Combustion Eng., Edgemoor, Erie City, Foster Wheeler, Heine, Keeler, Union and Vogt boilers.

•

Ask your nearest Belmont Distributor for a complete stock list. You will find him in our insert in the Packing Section of Conover-Mast Purchasing Directory.

BELMONT

The Belmont Packing & Rubber Company • Butler & Sepviva Sts., Phila. 37, Pa.

For more facts circle 544 on Reply Card

OPERATION—PRODUCTION

(O and P begins on page 64)

odes as light sensing elements with individual transistorized amplifier circuits. They pick up the presence of light or the shadow of the tubing so that the signal of the sensing circuit becomes a measure of the location of the tube.

This arrangement makes possible effective control of the dip height to plus or minus ⅛ in.

Saw Guard Improves Safety

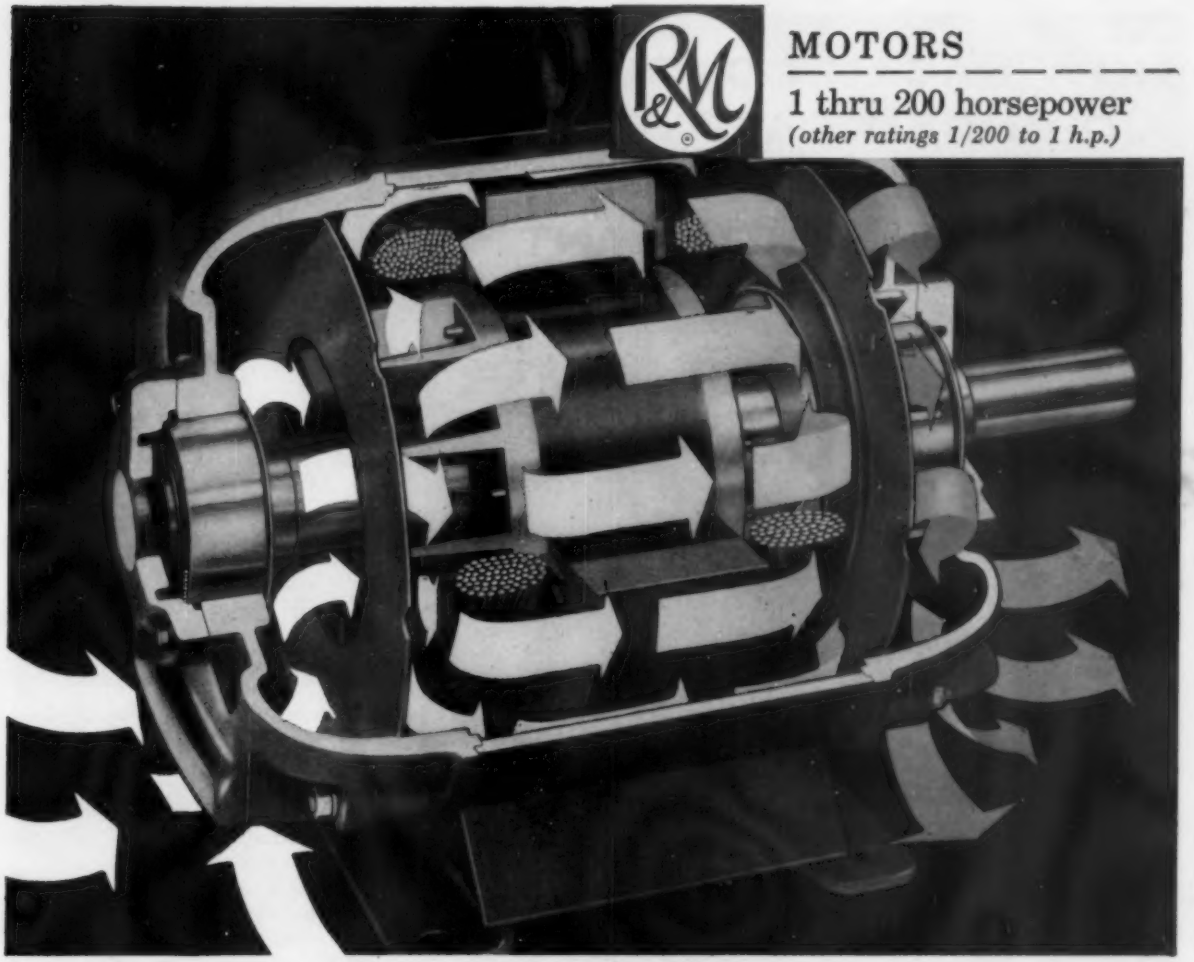
Equipped with an improved type of shatter resistant plastic, circular saw guards at the Electric Boat Company, Division of General Dynamics, New London, Conn., have helped to reduce accidents. Furnished by the Brett-Guard Corporation, Englewood, New Jersey, the saw guards use an aircraft type plastic that covers the saw blade but allows full vision and complete accuracy in operation of circular saw.

Hoppers Increase Oil Recovery

RECLAIMING used cutting oil from metal turnings has increased 60 per cent by replacing old oil drums with self-dumping hoppers at American Rivet Company, Chicago, Illinois.

Previously, oil drums were stationed at various points in machining areas to collect turnings and waste products produced during the manufacture of split and tubular rivets. Salvaging oil from these drums was inefficient and time-consuming since each drum had to be upended to empty the oil.

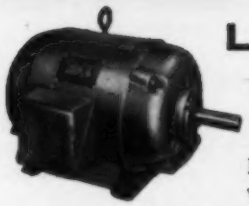
Now four self-dumping hoppers, made by Roura Iron Works, Inc., Detroit, are placed at a central col-



MOTORS

1 thru 200 horsepower

(other ratings 1/200 to 1 h.p.)

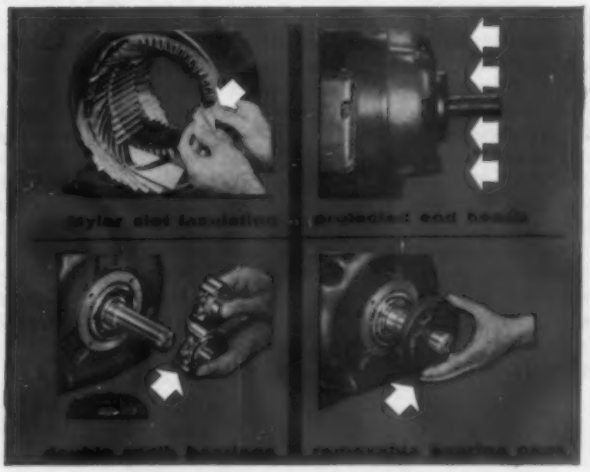


Longer Life because High Velocity *"Dual-Sweep"* ventilation *Cools and Cleans!*

ROBBINS & MYERS "Dual-Sweep" ventilation is a new concept in high velocity internal cooling and cleaning, designed to greatly prolong motor life. Tandem fans—one pushing, one pulling—create end-to-end ventilation that eliminates "dead" areas and converging air currents which deposit dirt. Venturi baffles at each end of the motor direct air in a washing action over and around end coils where it's most needed. Passages between field and outer shell form a "cylinder of air" which carries off motor heat.

R&M motors' long-life insurance also includes these features: Mylar* insulation that has 8 times the dielectric strength and 35 times more moisture resistance than ordinary paper insulation . . . double width bearings with extra-large grease capacity . . . end heads that offer full height protection . . . removable caps for quick bearing inspection and re-lubrication. For details, write today for Bulletin 520-PE

**DuPont registered trademark*



ROBBINS & MYERS, INC.

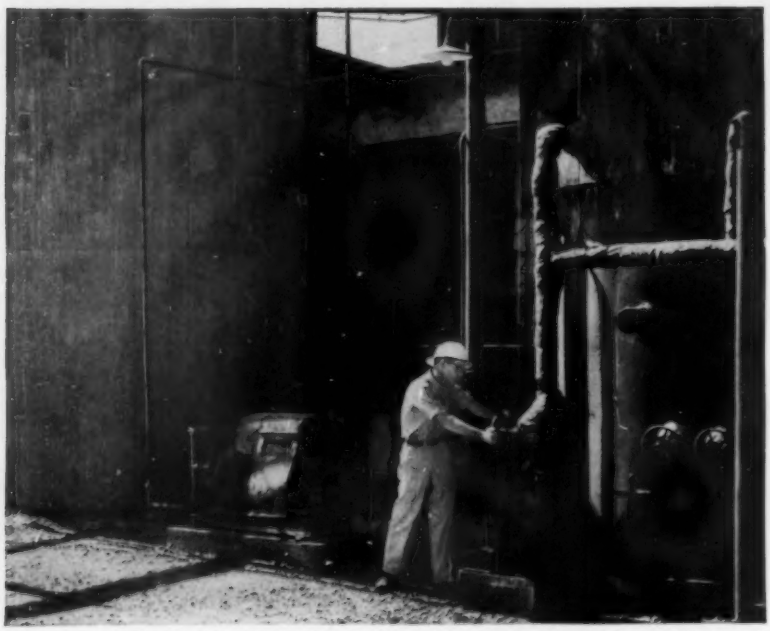
motors, household fans, Propellair industrial fans, hoists, Moyno industrial pumps

SPRINGFIELD, OHIO · BRANTFORD, ONTARIO

For more facts circle 545 on Reply Card

HOW HAGAN COAGULANT AID ENDED CARRYOVER PROBLEMS AT PENNSALT ACID PLANT

No extra feeding equipment needed



Tanks supply feedwater to the boilers which produce steam for the manufacture of sulphuric acid. Water clarifier tank is on right, treated water storage tank on left.

Quick case history—reading time 47 seconds

Pennsalt Chemicals Corporation's plant at Calvert City, Ky., had a serious floc carryover problem when clarifying with alum and activated silica. Filters clogged rapidly and carryover of floc to the boiler was highly undesirable.

Pennsalt engineers investigated the effect of various polyelectrolytes and recommended changing to alum and Hagan Coagulant Aid No. 7. After more than 18 months of this treatment, the plant reports these benefits:

- **elimination of the carryover problem**
- **reduction in overall chemical cost**

And, a great benefit from Pennsalts' point of view, the switch to Hagan Coagulant Aid was accomplished without the necessity of adding feeding equipment.

Hagan has a number of Coagulant Aids, all of which are easy to handle, and may be fed either dry or in solution. Many are approved for use in clarification of drinking water. To find out which of these Aids is best suited to solve your water clarification problem, write for Bulletin 410-12-2 describing the full line of Hagan Coagulant Aids.

CALGON COMPANY
HAGAN BUILDING, PITTSBURGH 30, PA.

DIVISION OF **HAGAN** CHEMICALS & CONTROLS, INC.

For more facts circle 546 on Reply Card

OPERATION—PRODUCTION

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Oil drain, on bottom of hoppers, increases oil recovery by 60 per cent.

lection point in the center of the machining area. Turnings and scrap are collected in small tote pans and emptied into the hoppers.

A short section of one-inch pipe with an elbow is attached to the lower side of each hopper. This allows oil to drain into pans placed alongside the hoppers.

Liner Stops Bar Feed Clatter

INCESSANT clatter of bar in the feed guide of automatic screw machines may soon be a thing of the past because of an idea being patented by A. M. Byers Company, Pittsburgh, Pa. Use of PVC pipe or other plastic materials as a feed guide liner not only reduces the noise but also prevents nicking or scratching of the workpiece.

The firm reports their PVC liners can be installed for as little as $5 on a single spindle machine. In some cases, PVC pipe can be used to replace the metal guide entirely.

Progressive Dies From Plywood?

USE OF FIR PLYWOOD in the making of deep-drawn metal parts is saving both time and money at the Ryan Aeronautical Company, San Diego, California. Conventionally, these parts are formed by using

C-L-X INTEGRATED CABLE SYSTEM

Requires no separate Duct or Conduit in any environment

Unusual pliability of C-L-X Sheathed Cables is shown here as the cable is being installed.

The revolutionary C-L-X Continuous, Corrugated, Lightweight, metallic sheath, that Simplex introduced to this country two years ago, is now available in *Aluminum*, *Copper* or *Bronze* as well as the enormously successful *Steel*.

Simplex C-L-X pliable cable systems provide unexcelled ease of installation and mechanical protection.

The *corrugated* metal sheath combines pliability for ease of installation with very great strength and seals the cable against penetration by oil, chemicals and moisture.

Depending on the environmental conditions of the installation, these power, control and communication cable systems can be furnished with or without plastic jacketing.

Light, and pliable, C-L-X cables are easily installed, and require no special reels.

Now, with corrugated *Aluminum*, *Copper* or *Bronze* sheathed C-L-X cable systems, the low resistance of these metals permits designs where the sheath may be used as a neutral or ground. These metals also permit the use of single as well as multiconductor cable assemblies in a-c power systems.

For complete details on C-L-X sheathed cables, contact your Simplex Engineer, or write direct.

See C-L-X in Steel, Copper and Aluminum at the PLANT MAINTENANCE SHOW BOOTH NUMBER 212

Simplex

WIRE & CABLE COMPANY

79 Sidney Street, Cambridge, Massachusetts

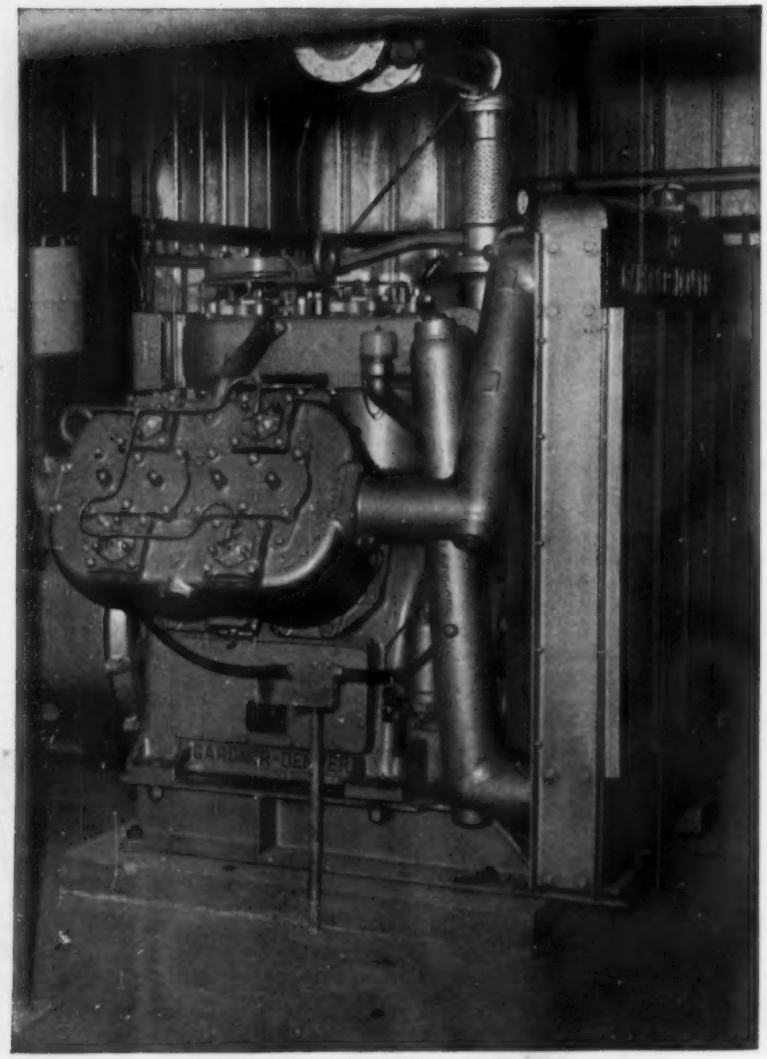
For more facts circle 547 on Reply Card

EQUIPMENT TODAY FOR THE CHALLENGE OF TOMORROW

GARDNER DENVER

Here's the compressor package you can spot in any corner of your plant, hook up and put to work. Foundation specifications are modest. It's a champion on performance, too—noted for two-stage, water-cooled efficiency. And it's a champion with staying power. Years without the touch of a wrench is not unusual for Gardner-Denver quality WB machines. Capacities from 142 to 1150 c.f.m. displacement. Write for Bulletin WB-10, or call your local Gardner-Denver compressor specialist. Gardner-Denver Company, Quincy, Ill.

Space-saving champ
...money-saving winner



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OPERATION—PRODUCTION

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a series of die sets to progressively deepen the draw. The blank is annealed between draws to prevent tearing.

In some cases, as many as ten die sets are needed to complete a draw. On experimental work, with only 10 to 12 parts required, tooling costs were frequently excessive. To reduce the number of these die sets needed, Ryan is using fir plywood as a tooling component, resulting in substantially lowered costs.

Fir plywood templates are stacked on the hollowed-out lower die to limit the draw on each stroke of the drophammer. It is important that the plywood be of the proper height and configuration to receive the brunt of each impact. With each additional hammer blow, the number of stacked templates is reduced. Every time the hammer strikes, the blank is forced down further into the lower die. The process is repeated until the final forming blow without the plywood templates.

Stack of plywood templates is gradually reduced to replace progressive dies.

Centrifugal Clarifier Extends Life of Grinding Wheels

REMOVING ground glass from a grinding coolant with a centrifugal separator has increased diamond grinding wheel life over 50 per cent

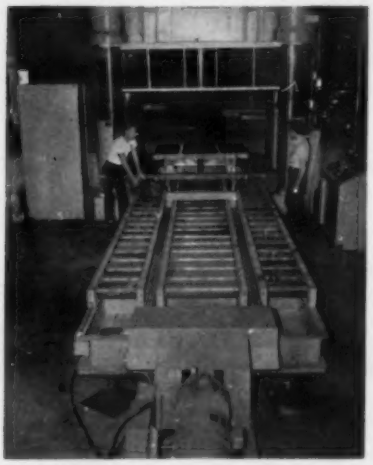
and eliminated a day-per-month grinding machine downtime at Alsco, Inc., Clifton, N. J. The ground glass is removed from the coolant with a De Laval clarifier installed in the coolant recirculation line of a glass grinding machine.

Ground glass from the grinding operation is washed into the coolant and carried to the centrifugal clarifier. The glass-laden coolant flows into the top of the centrifuge and into the center of the bowl.

Since the glass is much heavier than the coolant, it is thrown with greater force and accumulates on the wall while the clarified coolant is displaced up the wall to flow over the top for recirculation. More than 95 per cent of the suspended glass particles are removed in a single pass through the clarifier. This reduces wear by preventing recirculation of the ground glass.

Previous to the installation of the clarifier, a single set of grinding wheels ground four million inches of glass slats before requiring redressing and eight million inches before scrapping. With the centrifugal separator, these figures have increased to about six or seven million inches before redressing and proportionately more before scrapping. Daily production is about 100,000 inches of glass and the increased wheel life will save one set of $3000 grinding wheels each year.

Change Dies This Easy Way



Feeding and removing a variety of dies for the beds of two hydraulic presses, this die-handling table has simplified production at the Douglas Aircraft Company, Charlotte, N. C. Furnished by the Colson Corporation, the table is motorized to push dies into place.

WORK HORSE... RACE HORSE

Gardner-Denver piston and rotary air hoists

Only Gardner-Denver offers lightweight overhead air hoists for *both* the "work horse" and "race horse" jobs. Axial-piston hoists provide rugged, dependable operation with the control demanded for precise spotting. That's why hundreds of industrial plants rely on this Gardner-Denver hoist. New rotary air hoists are designed for use where the combination of speed and ruggedness is of primary importance—up to 90 fpm in 500-lb. capacity.

Popular models available from 150-4000 lb. Sparkproof construction and pendent control available.

PISTON HOISTS				ROTARY HOISTS			
MODEL	CAPACITY	SPEED	WEIGHT	MODEL	CAPACITY	SPEED	WEIGHT
86-1V10	1000	19	28	86R-5	500	90	27
86-2V20	2000	19	78	86R-10	1000	40	27
86-2V40	4000	10	100	86R-20	2000	20	30

EQUIPMENT TODAY FOR THE CHALLENGE OF TOMORROW

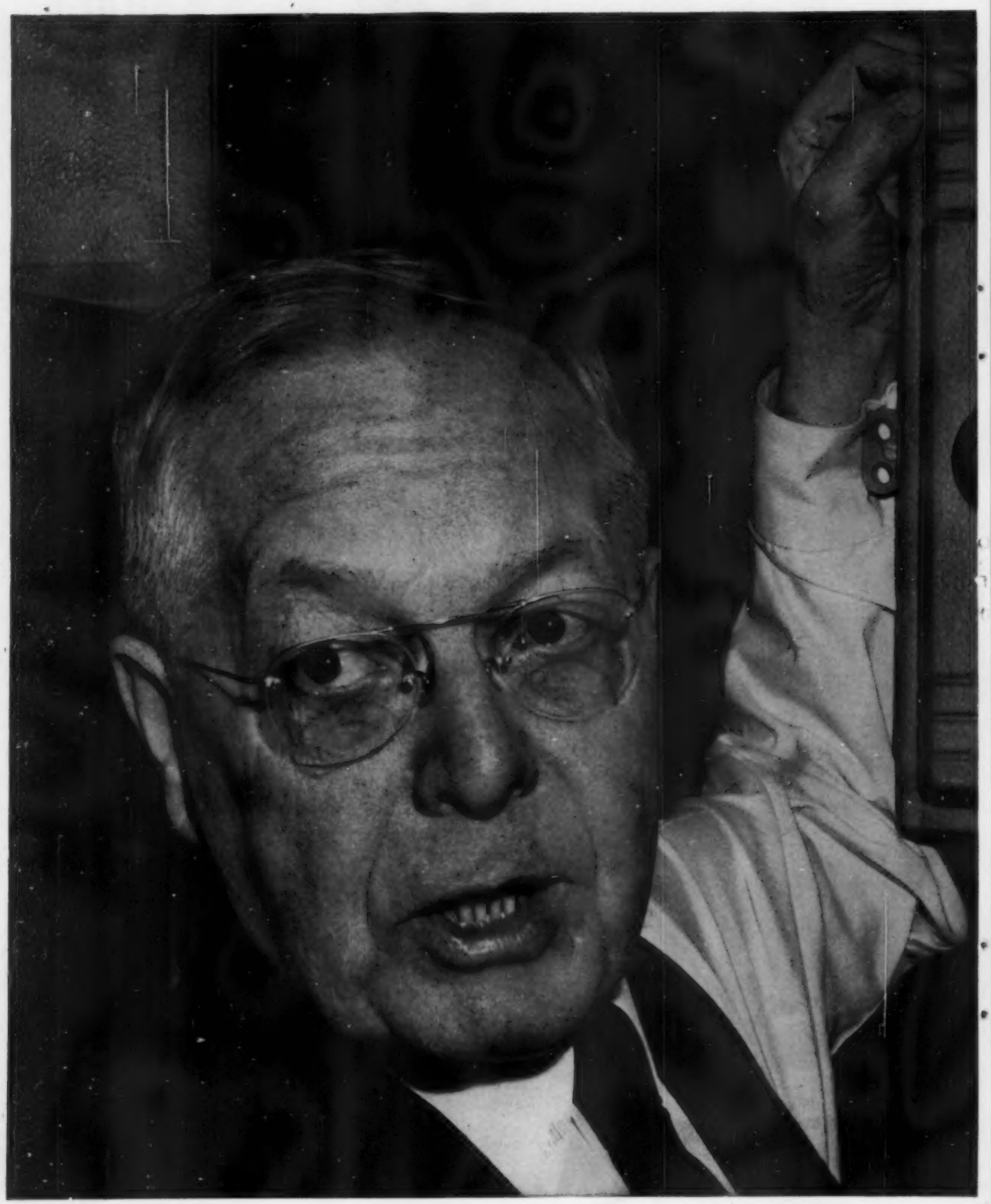
GARDNER-DENVER

Gardner-Denver Company, Quincy, Illinois

In Canada: Gardner-Denver Company (Canada), Ltd., 14 Curity Ave., Toronto 16, Ontario

For more facts circle 549 on Reply Card

"Nobody was going to pin an



'old-fashioned' label on me"

"Funny how easy it is to get behind the times. Like I was before I learned about circuit breakers. But nobody can say I'm not up-to-date now.

"All of a sudden, I began noticing the modern, enclosed circuit breakers in use by other plants . . . for machines, lights and production area outlets. Really up-to-date plants use them for practically everything. And engineers tell me they won't take anything else.

"Well, I decided to find out why. And today I use circuit breakers exclusively. What a difference. If we have an overload, we get power back in minutes . . . without idling people and losing production. And my job is easier and a lot safer.

"Cost? Shucks, a circuit breaker saves a whole lot more in production time than it costs new. Today there's darn little excuse for anybody not to use them.

"Here's something else I learned. The guys who really know circuit breakers use I-T-E over any other brand."

Send for the new free bulletin on how circuit breakers benefit industrial plants. Or see your distributor. Write I-T-E Circuit Breaker Company, Dept. SA, 1900 Hamilton St., Philadelphia 30, Pa.

I-T-E CIRCUIT BREAKER COMPANY

For more facts circle 550 on Reply Card

NEW AAF ROLLOTRON

cleans air electronically, rolls away the dirt!

- no water
- no washing
- no freezing problems
- no drains
- no oiling of plates

Here is the only air filtration unit in the world that offers

- **the efficiency of an electrostatic precipitator, and**
- **the minimum maintenance of an automatic-renewing, disposable media air filter,**

both in one space-saving unit!

This revolutionary new air cleaner is the Rollotron. Its unique operating principle is shown in the exploded "flow diagram" illustration.

In overall size, the Rollotron requires no more space than any other electrostatic precipitator. Regardless of unit height or width, depth is only 39"!

For complete information on "electronically clean air by the roll" see your local AAF representative or write for Rollotron Bulletin 249. Address: Mr. Robert Moore, American Air Filter Company, Inc., 228 Central Avenue, Louisville, Kentucky.

AAF **American Air Filter**

BETTER AIR IS OUR BUSINESS

For more facts circle 551 on Reply Card

For more facts circle 552 on Reply Card →

New green over Gotham

N.Y.C. Transit Authority is adding beauty, reducing future maintenance costs with Alcoa Pigmented Colored Aluminum Paint made by Amsterdam Color Works, Inc. N.Y.C.

N.Y. C. Transit Authority adds eye appeal with

AMSTERDAM COLORED ALUMINUM PAINT

How to protect *and* beautify over 60 miles of overhead railways, bridges and stations? New York City Transit Authority has begun to tackle a portion of the job with Amsterdam *Colored* Aluminum Paint, made with ALCOA® Pigment.

A projected five-year program will transform New York City's vast elevated railway system with two shades of aluminum-pigmented green. Here's a low-cost, major civic improvement, where everybody can see it. Look at the results already.

Aluminum paint has always been famous for long-term outdoor protection, exceptional coverage and ease of application. Now, a choice of fadeproof, metallic colors makes aluminum paint a better buy than ever.

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GENERAL ELECTRIC

- Superior design, features, and performance
- Faster shipment
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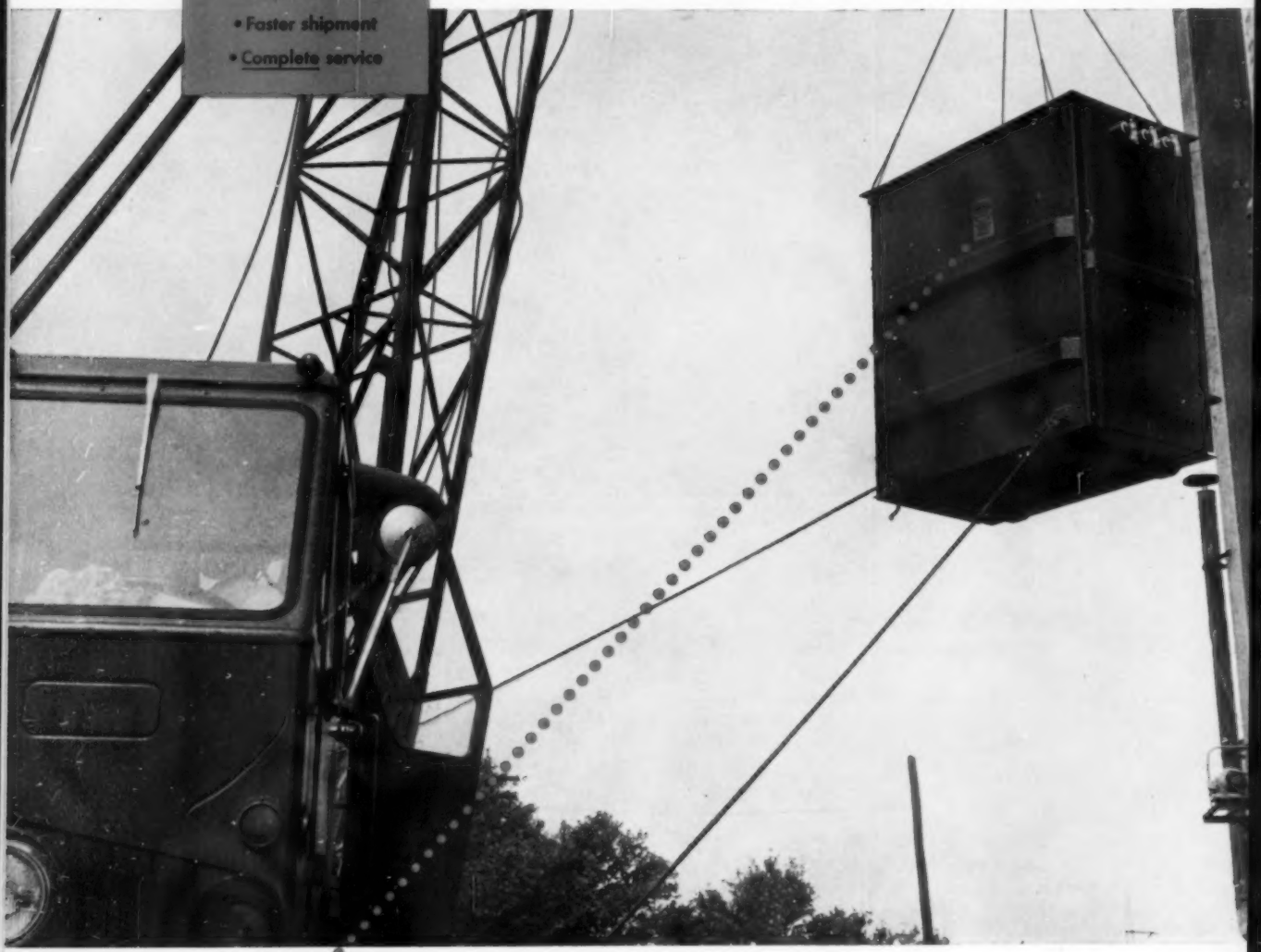
14% lighter;



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With this seal, General Electric certifies full value for your transformer dollar; full value in terms of superior basic design, features, and performance . . . plus faster order handling and shipment . . plus complete service before, during, and after installation. No other transformer manufacturer can match this complete General Electric package.

easier to install, maintain

General Electric dry-type transformers feature all-aluminum conductors, low sound levels, and superior insulation

Easier installation . . . safer, quieter operation . . . less maintenance . . . and longer life . . . all are features of General Electric's lighter full-value dry-type transformers.

Use of aluminum for all current-carrying parts has reduced weight up to *14 percent over previous designs!* This means simplified installation on roofs, catwalks, and other overhead locations. Sound levels meet or are lower than published standards. Transformers last far longer with exclusive Alpholite* insulation and added reliability is made possible by the higher impulse levels listed below:

Voltage Class (KV)	Impulse Levels (KV)
1.2	10
2.5	20
5.0	25
8.6	65
15.0	65

These important time- and money-saving features are yours with *every* General Electric dry-type transformer—open and sealed.

Minimum Maintenance

Maintenance is minimized with G-E dry-type transformers. Open-dry units—for indoor use—require only periodic cleaning of core and coil structure. Sealed units—ideal for dusty, dirty, or other contaminated atmospheres—need only an occasional exterior painting.

For information on full-value transformers, contact your G-E Apparatus Sales Engineer or Agent today. Write for GEA-6668 and GEA-6790. General Electric Co., Schenectady, N. Y.

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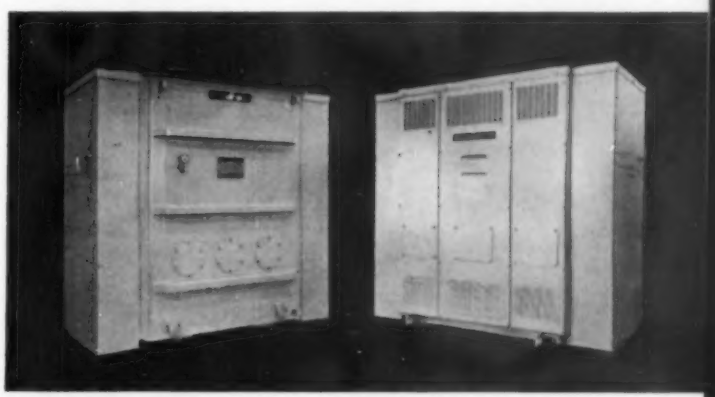
* Trade-mark of General Electric Company.

ALUMINUM CONDUCTORS in General Electric dry-type units reduce weight up to 14%.

ALPHOLITE INSULATION provides high dielectric barrier between windings.



GENERAL ELECTRIC'S FULL LINE of transformers includes sealed (left) and open-dry types, 300 kva and above.

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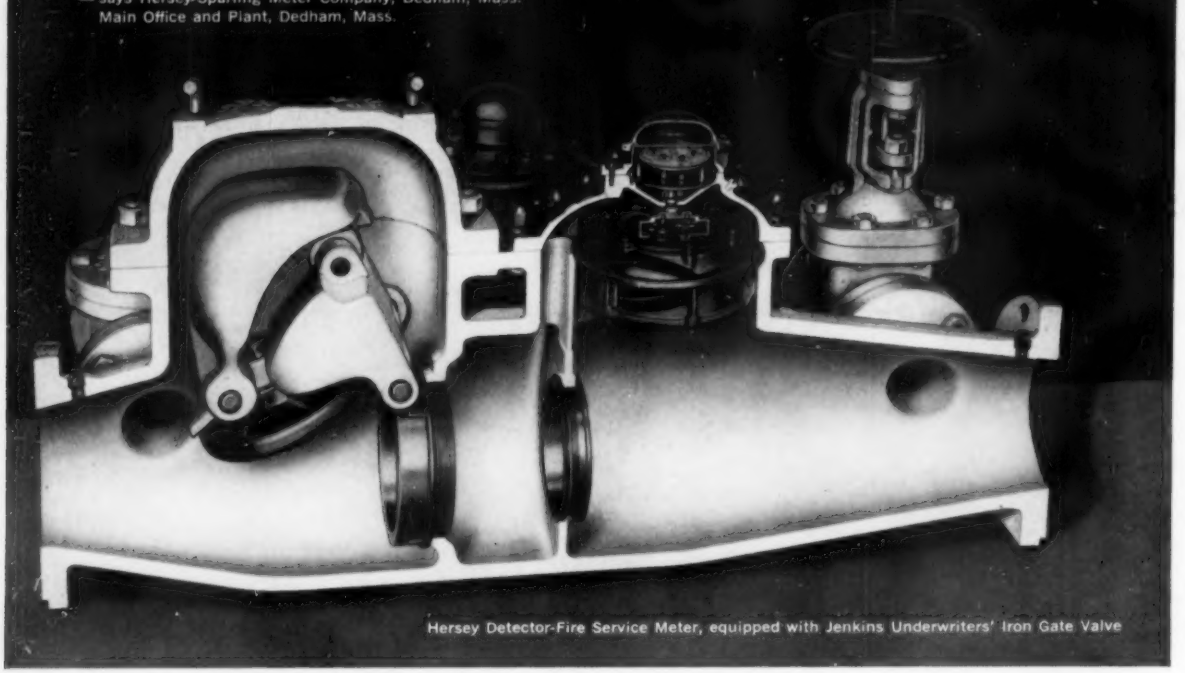
"YOU DON'T SHOP FOR VALVES

when you aim to build completely reliable equipment like our HERSEY METERS"

— says Hersey-Sparling Meter Company, Dedham, Mass.
Main Office and Plant, Dedham, Mass.



Hersey Detector-Fire Service Meter, equipped with Jenkins Underwriters' Iron Gate Valve

for 35 years, Hersey Meters have been equipped with JENKINS VALVES

Century-old Hersey-Sparling Meter Company does everything possible to make good its slogan — *You can't buy a better Water Meter than Hersey*. One example is seen in a rule that any part of the meter not made by Hersey must be obtained from sources which have Hersey's own policy of making the *Best*. For valves, Hersey's standard for quality has been JENKINS for 35 years.

Hersey-Sparling's customers, like the buyers of any equipment that incorporates valves, see the famous Jenkins DIAMOND trade-mark on the valves as a sure sign that nothing has been spared in assuring reliability and low maintenance costs. Architects, engineers, contractors and operating men are bound to respect equipment that carries the valves they so often specify to assure trouble-free piping systems.

Of course, valves of less quality can be had for a little less money. But it is worth remembering that Jenkins Valves, so widely known for reliability, cost no more than any *good* valves. Jenkins Bros., 100 Park Ave., New York 17.

JENKINS VALVES JENKINS SINCE 1864 Jenkins Bros. **MOST TRUSTED TRADE-MARK IN THE VALVE WORLD**

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BETTER LIGHTING QUALITY
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10% BETTER MAINTENANCE

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Guth 25% Uplight fixtures produce powerful downlighting and afford 27° normal shielding. They wash away gloom and overhead shadows, improve eye comfort and working conditions . . . assure maximum lighting efficiency, plus less maintenance, even under the poorest area conditions.

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. . . red, green and yellow "signals" to direct traffic, protect workers, identify plant or storage areas.

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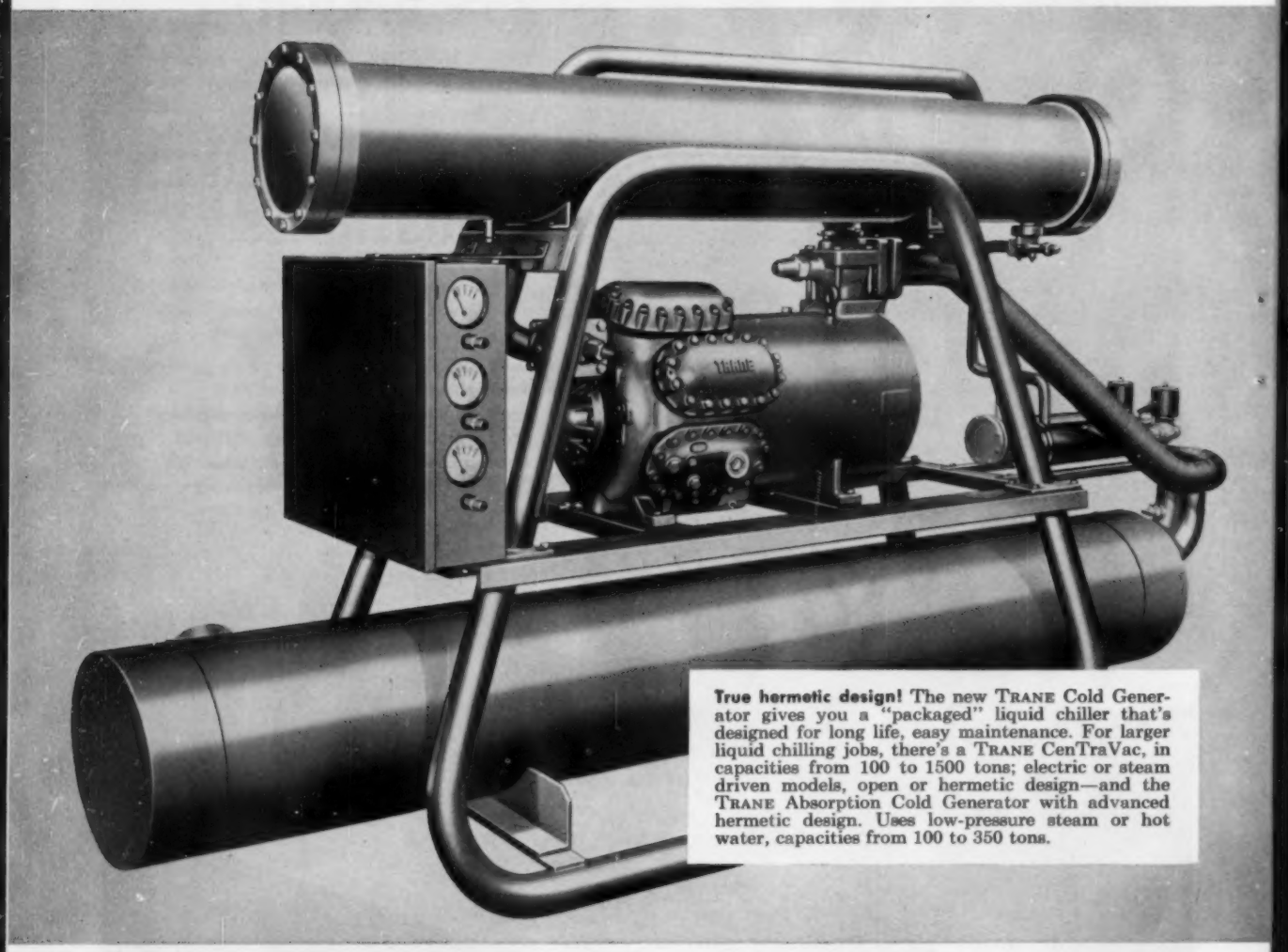
Cut liquid chilling costs-with this new Trane



True hermetic design! The new TRANE Cold Generator gives you a "packaged" liquid chiller that's designed for long life, easy maintenance. For larger liquid chilling jobs, there's a TRANE CenTraVac, in capacities from 100 to 1500 tons; electric or steam driven models, open or hermetic design—and the TRANE Absorption Cold Generator with advanced hermetic design. Uses low-pressure steam or hot water, capacities from 100 to 350 tons.

Now! A hermetic model of the Trane Reciprocating Compressor!

Here's a new, efficient Reciprocating Compressor that's *fully hermetic*, designed for the more rigorous demands of R-22. This unit is of single-housing construction. Motor and compressor are in one shell, with a bolted end cover for easy access. This minimizes alignment problems experienced with other hermetic compressors that have 2-part housing.

The new TRANE Hermetic Reciprocating Compressor has multi-step capacity control that saves power by reducing starting, stopping. And the truly hermetic design eliminates crankshaft seal and coupling to provide quiet operation, simplified installation, longer life.

Check these features:

- **Designed for R-22 and R-12** (not a converted R-12 machine).
- **Single-housing construction** for simplified installation, trouble-free operation, easy access for maintenance.
- **Multi-step capacity control** reduces starting, stopping, saves power.
- **Exclusive internal thermal protector,** located in the motor windings, protects against any condition that causes high motor temperatures.
- **Large suction chamber** and cylinder head safety springs provide protection against refrigerant slugging.
- **Available** in sizes from 10 to 100 tons.

for comfort or process-
Hermetic Cold Generator

Advanced hermetic design assures long, trouble-free life, quiet operation. Cuts installation costs.

Here's low-cost, efficient liquid cooling for process or comfort—from TRANE, long an industry leader in reciprocating water chillers. It's the new TRANE Reciprocating Cold Generator, now *hermetic*, with TRANE chiller and condenser —plus a new TRANE Hermetic Compressor (illustrated and described below).

A major step forward in industrial liquid cooling equipment, this new Hermetic Cold Generator features lightweight, compact design that simplifies installation and maintenance. It is completely factory-wired and assembled, with prewired control panel mounted directly on the unit to eliminate much on-the-job installation labor. Designed for R-22 and R-12, it is available in a complete range of 11 sizes from 10 to 100 tons.

When you plan industrial liquid chilling equipment—for processing or air conditioning—contact your nearby TRANE Sales Office for facts on the complete line of TRANE water chillers from 10 to 1500 tons; or write TRANE, La Crosse, Wisconsin.

Check these advanced TRANE features:

- **All major components,** chiller, condenser, compressor, designed and built by TRANE.
- **Advanced hermetic design** assures maximum efficiency, simplified maintenance and installation.
- **Compact size;** small enough to pass through a standard 36"-wide door.
- **Packaged design;** factory-wired and assembled to cut on-the-job labor. Pneumatic or electric control panel mounted and prewired.
- **Versatile.** May be used for any process or comfort liquid cooling application . . . to maintain constant temperature for electro-plating baths and other critical operations. Units available for use with evaporative or air-cooled condensers.

For any air condition, turn to

TRANE

MANUFACTURING ENGINEERS OF AIR CONDITIONING, HEATING, VENTILATING AND HEAT TRANSFER EQUIPMENT

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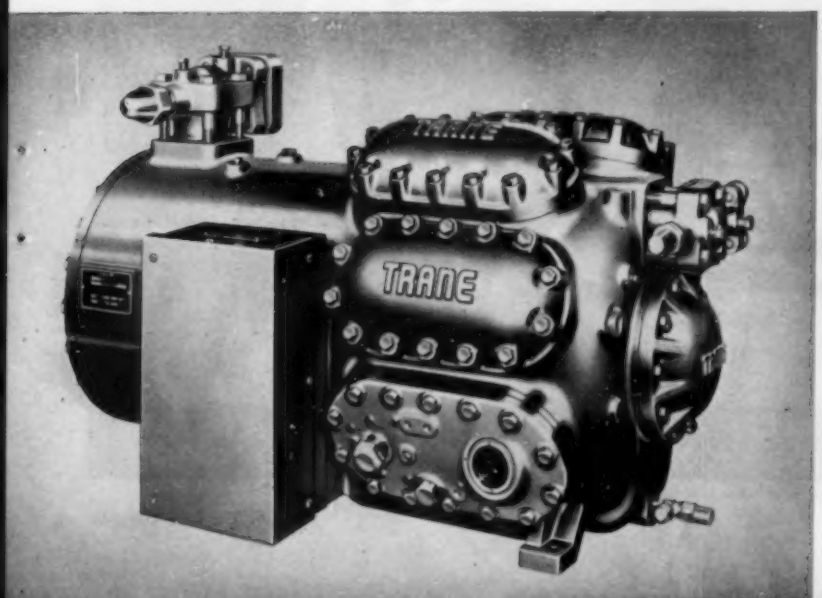

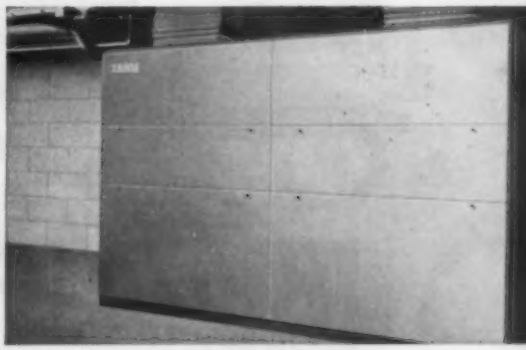

Trane Commercial Self-Contained Air Conditioners feature the new TRANE Hermetic Compressor. Quiet and compact, these units provide maximum cooling comfort for office, laboratory or factory areas. Job-matched to fit your budget, fit your needs. Air or water-cooled models in sizes from 10 to 50 tons.

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One source for all your fitting needs

FEATURING . . .

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- Rustproof, corrosion-proof
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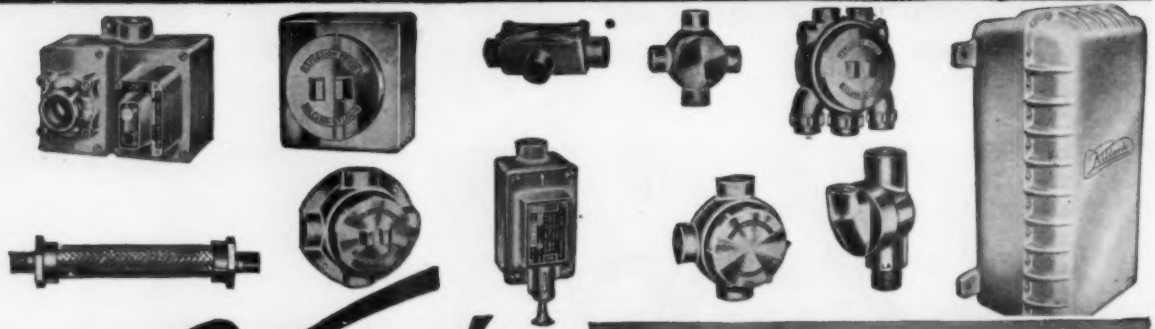
STANDARD LOCATIONS

EXPLOSION-PROOF FITTINGS



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Vandeventer & Easton, St. Louis 13, Mo.

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- ☐ Vapor-Tight Light Fixtures Catalog No. 12
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for Pumps, Engines and Compressors

Selecting the proper metal packing—and packing ring material —assures positive, efficient sealing against gas, air, steam.

Specifying the right material for metal packings can make a big difference in seal effectiveness and packing life. Garlock offers a wide choice, each designed for specific temperatures and pressures:

GRAPHITIC CAST IRON. Unequaled wear-resistant qualities. Graphite assures continuous lubrication between packing and rod. Recommended against 1500 p.s.i. pressures, 800°F temperatures.

STANDARD HI-LEAD BRONZE. Chosen after years of research, this standard bronze has a yield point of 26,000 lbs./sq. in., a tensile strength of 31,250 lbs./sq. in. Can be used against 10,000 p.s.i. pressures, 800°F temperatures.

HI-LEAD SUPER BRONZE. Possesses a yield point of 14,750 lbs./sq. in., a tensile strength of 25,500 lbs./sq. in. Due to better wear properties, it can be used at pressures to 40,000 p.s.i., temperatures to 800°F.

AMBERITE—PLAIN OR GRAPHITIZED. Tough, strong, high impact strength. Excellent where corrosion and mildly difficult lubricant and wear conditions exist. Apply against 600 p.s.i. pressures, 250°F temperatures. Other grades available to meet various conditions.

BABBITT. Used on soft rods and where corrosion is present, lubrication is limited. Standard Babbitt has tensile strength of 10,000 lbs./sq. in. More expensive type has better wear qualities. Recommended for 5000 p.s.i. pressures, 425°F temperatures.

CARBON. Used where no lubricant is allowed. Generally affords the best wear-strength combination available. 700°F is recommended temperature limit; pressures may vary according to grade of carbon used.

TEFLON.* Far superior to many other rod packing materials because of outstanding chemical resistance, ability to retard wear and friction. Available in carbon- or glass-filled.

GARLOCK

Discuss metal packing materials with your Garlock representative. Call him at the nearest of Garlock's 26 sales offices and warehouses throughout the U. S. and Canada. Or, write for Catalog AD-166. The Garlock Packing Company, Palmyra, N. Y.

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Order from the Garlock 2,000 . . . two thousand different styles of Packings, Gaskets, Seals, Molded & Extruded Rubber, Plastic Products

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COURT DECISIONS —a summary of legal findings of interest to the plant engineer

Prepared by Albert Woodruff Gray

Common Ownership

ONE MAN was president and owner of two St. Louis corporations, a machine tool and die company and a plastics manufacturing plant. A strike was called against the plastic company. The tool and die plant was picketed by the striking employees of the plastic company.

Proceedings were brought before the National Labor Relations Board for an injunction against this picketing and a temporary injunction was granted. It was later vacated and the proceedings dismissed because of what the Board termed a common ownership and control of the two corporations and that, in the purview of that Board, they were one employer.

The dismissal was set aside by the Federal court.

"We fail to see why the tool and die company should, under the evidence, be regarded as an offending employer or why it and its employees should be embroiled in the controversy between Plastics and its employees and their union, merely because the president of the tool and die company, who was also the president of Plastics, controlled or participated in the control of the labor relations of the company." Court brief 266 Fed. 2d 599, May 15, 1959.

Carrier's C. O. D. Liability

STEEL WAS shipped by a metal products company and delivered to the carrier under a c.o.d. agreement. The steel was delivered by the initial carrier to a connecting carrier which, instead of cash, accepted checks from the consignee which were forwarded to the shipper. The checks were returned, unpaid, and the shipper sued the initial carrier.

Defense claimed the shipper, having accepted the checks, had lost any claim it had against either carrier and had ratified the acceptance of checks in place of cash. Further, that any claim the shipper might have was not against the initial carrier but against the connecting carrier.

"The connecting carrier," said the court, in awarding the shipper judgment, "failed to perform the terms of the c.o.d. contract by collecting the price of shipment from the consignee in cash. The acceptance of the checks from the connecting carrier was not a ratification of any act in violation of the c.o.d. contract.

"The delivery of the checks constituted not an absolute but merely a conditional payment and the acceptance of them did not release from liability either the person giving the checks or any other person liable for the debt if the debt was not paid.

"It is important to note that a carrier handling a c.o.d. shipment acts in a dual capacity. When a carrier makes a contract to collect on delivery it stands with reference to it just as any other agent and is bound to a strict compliance with its undertaking." Court brief 152 Atl. 2nd 275 June 10, 1959.

Employment and Union Dues

AN INJUNCTION AGAINST the enforcement of a union shop agreement was presented before the Georgia Supreme Court for review. Under this agreement employees, as a condition of their employment were required to pay union dues. The money was used in the support of political or economic programs or candidates for office.

In sustaining this injunction against the enforcement of such provisions, the Georgia court said: "One who is compelled to contribute the fruits of his labor to support or promote political or economic programs or support candidates for public office is just as much deprived of his freedom of speech as if he were compelled to give his vocal support to doctrines he opposes.

"Abraham Lincoln asserted a similar view when he said, 'I believe each individual is naturally entitled to the fruits of his labor so long as it in nowise interferes with any other man's rights.'" Court brief 108 S.E.2d 796, May 8, 1959.

Used Containers

USED CONTAINERS were purchased by a shipper. When delivered, the containers were unclean and contaminated. As a consequence the goods shipped by the purchaser of these containers were spoiled.

Suit was brought by the purchaser against the seller of the containers. The seller contended in its defense that it was a dealer in second-hand barrels which carried neither an express nor implied warranty of fitness.

In sustaining a judgment that the shipper can recover damages, the court said: "The Uniform Sales Act provides, in part, as follows:—'Subject to the provisions of this act and of any statute in that behalf, there is no implied warranty or condition as to the quality or fitness of any particular purpose of goods supplied under a contract to sell or a sale except as follows: where the buyer expressly or by implication makes known to the seller the particular purpose for which the goods are required and it appears that the buyer relies on the seller's skill or judgment, there is an implied warranty that the goods shall be reasonably fit for such purpose.'"

To this the court, in affirming the judgment against the seller, added: "The overwhelming number of states that have adopted the Uniform Sales Act have held that there are implied warranties with respect to used goods." Court brief 97 N.W.2d 56, June 5, 1959.

Right to Work Ordinance

ACTION WAS brought by an employer in California against a labor union and its secretary for an injunction against the activities of this union in San Benito County to induce an employer to enter into a union shop agreement.

In that county an ordinance had been adopted that read in part, "No person shall be denied the opportunity to obtain or retain employment because of non-membership in a labor organization nor shall the county, any agency thereof or any corporation, individual or association of any kind, enter into any agreement, written or oral, which excludes any person from employment because of non-membership in a labor organization."

Of such legislation relating to closed shop agreements such as those prohibited by this ordinance, the court said, in denying the employer this injunction: "It is important to note, as will hereinafter be emphasized, that notwithstanding the pushing and pulling as between big business and increasingly powerful labor organizations, the State of California—and the proponents of its legislation—made the welfare of the individual worker, through the principle of freedom to associate, organize and bargain collectively, the paramount principle of its legislation."

A further reference to state and local enactments was made by the court in refusing to grant any in-

COURT DECISIONS

junction against the enforcement of the county right-to-work ordinance. "It attempts to cut across the legislative declared state-wide policy as to the full freedom of employees for self organization and for voluntarily selecting and negotiating through their own employee committees or agencies. Therefore, the ordinance must be declared invalid in its entirety. Inasmuch as this union's and its secretary's objective—a lawfully negotiated union shop contract—is proper, the means by which they seek such objective are lawful and the employer has no cause of action." Court brief 339 Pac. 2d 801, May 19, 1959.

Seismographic Exploration

EXPLOSIONS ON Montana ranch lands occasioned by the conduct of seismograph exploration activities destroyed a spring of water used by the owners of ranch land.

The exploratory work had been done initially with the consent of the owner. However protests had been made when a third hole for this blasting had been drilled too close to the spring. In reversing a judgment absolving the oil company of damages for trespass, the Montana Supreme Court said:

"If by their words or actions the owners consented that the oil company might enter their lands for seismograph operations, when they caused explosions so near the spring as to destroy its flow, over the owners' protest, the oil company was a trespasser from the beginning." Court brief 340 Pac. 2d 824, June 4, 1959.

Manufacturer's Liability

A MANUFACTURER omitted the markings on an abrasive wheel that indicated the maximum revolutions per minute which the wheel could safely make. The wheel "blew up" in the face of an employee of the purchaser. The workman sued the manufacturer for damages and the decision held the manufacturer liable for the consequences of this negligence.

"It should now be recognized," said the California court, "that a manufacturer incurs an absolute liability when an article that he has placed on the market, knowing that it is to be used without inspection, proves to have a defect that causes injury to human beings.

"In this case the source of the manufacturer's liability was his negligence in the manufacturing process or in the inspection of component parts supplied by others. Even if there is no negligence, however, public policy demands that responsibility be fixed wherever it will most effectively reduce the hazard to life and health inherent in defective products that reach the market.

"It is evident that the manufacturer can anticipate some hazards and guard against the recurrence of others, as the public cannot. Those who suffer injury from defective products are unprepared to meet its consequences." Court brief 343 Pac. 2d 261, California, August 28, 1959.

Misrepresentation of Mileage

MILEAGE REGISTERED by the speedometer of an automobile had been inadvertently reduced by a filling station mechanic from an actual mileage of 50,000 to 22,000 miles. No correction was made by the owner when he offered the car for sale and the purchaser bought the car, believing that the mileage registered by the speedometer was correct.

Later suit was brought against the seller for fraud. This four door station wagon had been sold for $1425. In awarding the purchase actual and punitive damages in the amount of $1275, the Ohio court said:

"Though generally mere silence does not amount to fraud there are times and occasions when it becomes the duty of a person to speak in order that the party he is dealing with may be placed on an equal footing with him, when a failure to state a fact is equivalent to fraudulent concealment and amounts to fraud equally with an affirmative falsehood.

"The court believes the nondisclosure of the material fact of the true mileage on the automobile offered for sale as a used car, the intention being clear from other accompanying acts, constituted actionable fraud under rules approved and followed in Ohio." Court brief 160 N.E. 2d 583, Ohio, April 29, 1959.

Subcontractor's Negligence

CONTRACT FOR the construction of oil storage tanks was made in California between two companies and portions of the work were subcontracted to a steel company. A provision in the contract was: "The constructor may require the subcontractor to install additional safeguards and observe such special safety precautions as appear to be necessary."

In the construction of one of these tanks, plates each weighing over a ton and approximately 32 ft long, were welded along the vertical seams with the exception of one joint. The plates were then put in position, aligned with the ring already fixed by the plates in place and the remaining horizontal seam welded.

In the course of the work on this tank several of these plates pulled off the ring and fell inside the tank bringing the collapse of the entire ring of plates.

Suit was brought by the injured employees against the general contractor on the ground that it was the duty of the general contractor to enforce the contract provision for the installation of additional safeguards by the subcontractor.

In sustaining the dismissal of this action against the general contractor, the California appellate court said: "The reasoning behind the rule that the general contractor is not liable to the employees of an independent contractor for the latter's negligence, is that it imposes a duty upon the general contractor directly to oversee all labor being performed and to inspect every device imported for use by the workmen on a particular construction and to impose a non-delegable duty upon him to enforce all statutory provisions and would place an extremely onerous burden upon him who has the general control over the ultimate result of the labor done yet without control or management of means utilized to achieve the purpose planned." Court brief 342 Pac. 2d 495, California, July 29, 1959.

Contract Repudiation

FOR MAKING improvements on a building in Atlanta, Georgia, the owner of the property promised the workman wages at the prevailing rates and a half interest in his business that was to be conducted in the building.

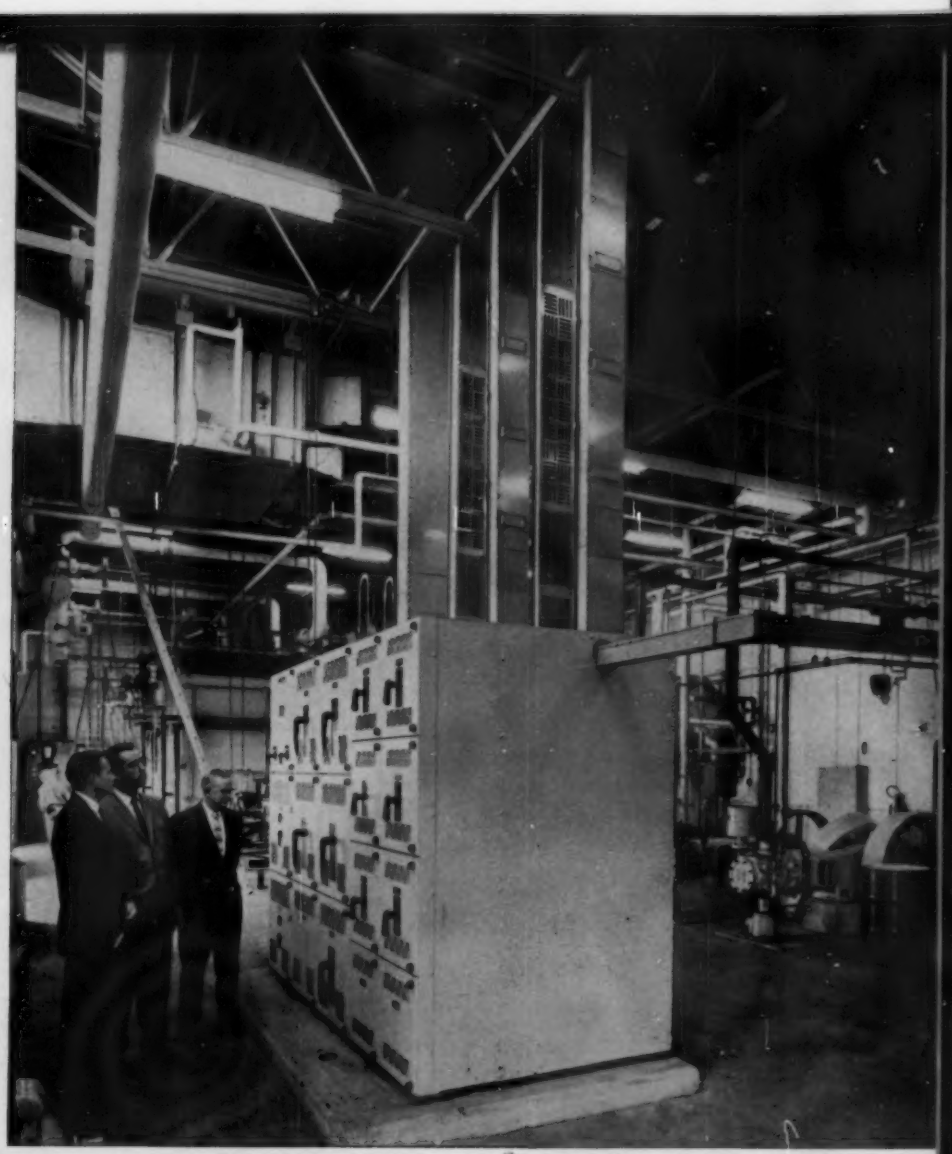
Before the completion of these improvements, the owner repudiated the agreement and suit was brought by the workman for the value of the services already rendered. In his defense, the owner maintained that he owed nothing until there were profits to be divided from the business he had agreed to share.

Sustaining a judgment against the owner for the damages suffered by the workman, the Georgia court said:

"Where a contract of employment has been breached by the employer after the employee has performed services, the employee has an election either to sue for the damages resulting from the breach of the contract or to sue for the value of the services. One cannot receive and retain the benefit of another's work and labor without paying him a reasonable amount for the value thereof." Court brief 109 S.E.2d 313, Georgia, May 27, 1959.

Peter Paul Powers-Up
new candy plant
to serve growing market
YOU CAN BE SURE... IF IT'S Westinghouse

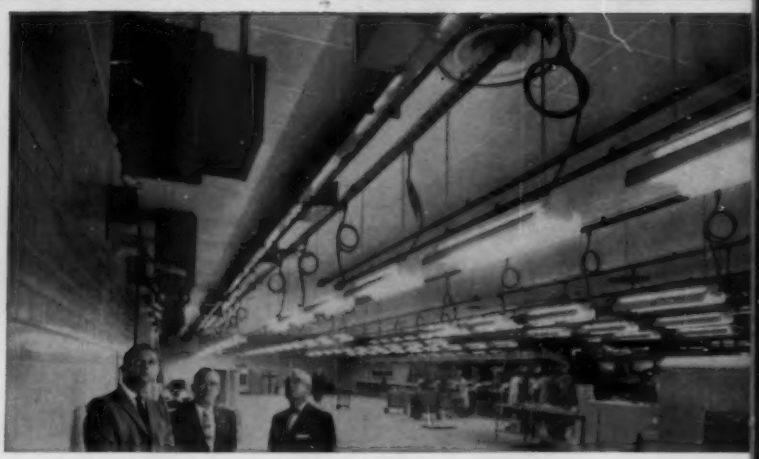
COVER PHOTO: Conveyor carries finished "indescribably delicious" candy bars to packaging stations.



J. R. Miller, Westinghouse Construction Sales Engineer; D. J. Taylor; and H. P. Bettge discuss protection provided by drawout-type DB circuit breakers in the Westinghouse low-voltage switchgear. Blank compartments have been allowed for future breaker additions. Four bus duct feeder runs from this metal-enclosed switchgear distribute power throughout the entire plant.

J-94137-2

Parking lot of the new Peter Paul, Inc., plant in Frankfort, Indiana, has Westinghouse OV-20 luminaires installed on twin mast arms. Westinghouse mercury-vapor lamps in the fixtures combine glare-free visibility with virtual elimination of maintenance.



D. J. Taylor, The Sanborn Electric Co., Electrical Contractor; H. P. Bettge, J. M. Rotz Engineering Co., Consulting Engineers; and Lloyd Williams, Branch Manager, WESCO, Indianapolis, inspect one of the Westinghouse 40-kvar, type MDP capacitor assemblies in the main production area. Overhead bus duct is already installed to accommodate the addition of two more candy production and packaging lines. Mounted along the wall are five type DT-3 dry-type transformers to supply low voltage for lighting and power receptacles. Industrial fluorescent fixtures, type 2WVO, are used throughout entire production area.

Candymaker's plant has reserve electrical capacity to triple production

The new Frankfort, Indiana, plant was built by Peter Paul, Inc., to provide for the manufacture and distribution of its nationally known products, "Mounds" and "Almond Joy" for the Midwestern section of the U. S. The plant has two manufacturing and packaging lines. Anticipating the need for plant expansion, the owner, consultant and electrical contractor worked with Westinghouse to plan and install an electrical system that allows for additional production lines in the future . . . *without adding to the present electrical distribution system.*

Careful analysis of the electrical system led Westinghouse engineers to propose use of bus duct in place of conduit and cable throughout the plant. Plug-in-type bus duct not only permits ready addition of feeders when needed but actually *saved in initial cost* as compared to the original conduit and cable specifications.

Incoming low-impedance bus duct carries 4000 amperes from utility company transformer bank to main Westinghouse switchgear. Full power distribution within the plant is provided by runs of 800- and 1000-amp plug-in bus duct and 800- and 2000-amp low-impedance bus duct. This 480-v power is reduced to utilization levels by use of lightweight Westinghouse dry-type transformers mounted, in most cases, above the production areas.

All circuits in the plant are protected by Westinghouse circuit breakers; not one fuse is to be found in the plant. Circuit breakers protect against short circuits and overloads and eliminate loss of valuable down time in case of faults.

(continued)

YOU CAN BE SURE...IF IT'S

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J-94137-3

J. R. Miller and H. P. Bettge tour the box assembly area. End of an 800-amp, low-impedance bus duct adapts to a run of plug-in bus duct to supply box assembly machine motors. A 15-kva type EP dry-type transformer, above, feeds the flush-mounted type NLAB panelboard shown below for distribution to lighting circuits. The 40-kvar type MDP capacitor unit maintains correct voltage and power factor for maximum lighting and motor efficiencies. Of their capacitor investment, Mr. Bettge says, "They will pay for themselves in three years."

W. B. McKenzie, Peter Paul Chief Engineer; E. C. Eigenbrot, Assistant Engineer; and D. W. Manes, Westinghouse Bus Duct and Panelboard Specialist, inspect a type CDP convertible distribution panelboard. Westinghouse AB De-ion® circuit breakers in panelboard protect against overloads and short circuits.

W. B. McKenzie inspects one of the new Life-Line® right-angle gearmotors. This 1½-hp, 45-rpm Moduline* gearmotor drives the chocolate circulating pump. Westinghouse Moduline gearmotors provide quiet, efficient operation for power transmission needs.

*Trade-Mark

H. P. Bettge (center) describes advantages of Westinghouse motor control center to D. J. Taylor, and M. C. Wetterlin, Westinghouse Sales Engineer. Grouping of motor controls saves on inspection time and reduces service problems. The class 11-350 Control Center has blank space available at the bottom where starter units can be added when necessary.

Reserve electrical capacity to triple production *(continued)*

Westinghouse can help with any of your electrical planning and construction requirements. See your Westinghouse distribution outlet, or write: Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pa.

OWNER: Peter Paul, Inc., Naugatuck, Conn.

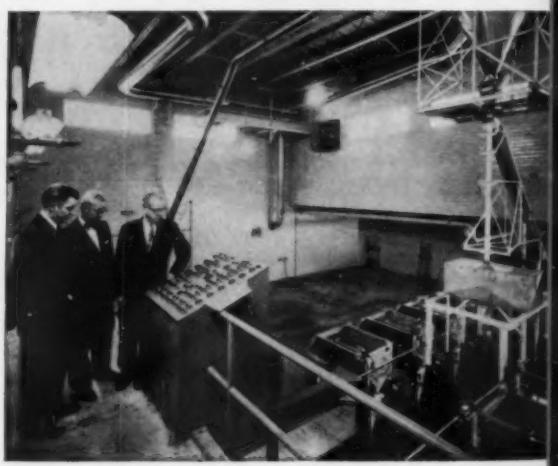
ARCHITECT: Daggett-Naegele and Daggett, Inc., Indianapolis, Ind.

CONSULTING ENGINEER: J. M. Rotz Engineering Co., Indianapolis, Ind.

ELECTRICAL CONTRACTOR: The Sanborn Electric Co., Indianapolis, Ind.

WESTINGHOUSE DISTRIBUTOR: Westinghouse Electric Supply Co., Indianapolis, Ind. J-94137-4

R. E. DeRaismes, Plant Manager of the Frankfort division; Lloyd Williams; and L. J. Hougland at the operator's control console. This centrally located desk utilizes standard Westinghouse pushbuttons and indicating lights for remote starter operation in the motor control center.



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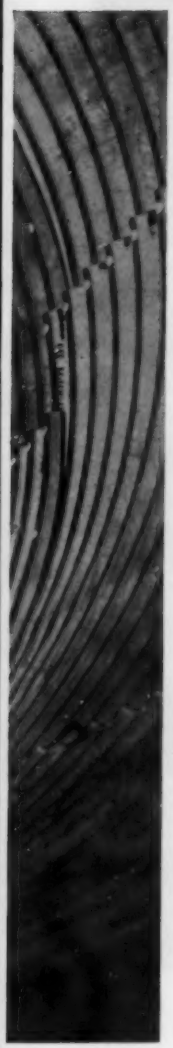
DRAINAGE STRUCTURE



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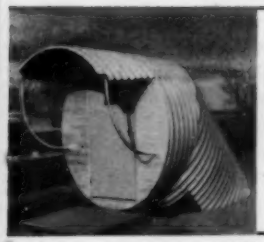

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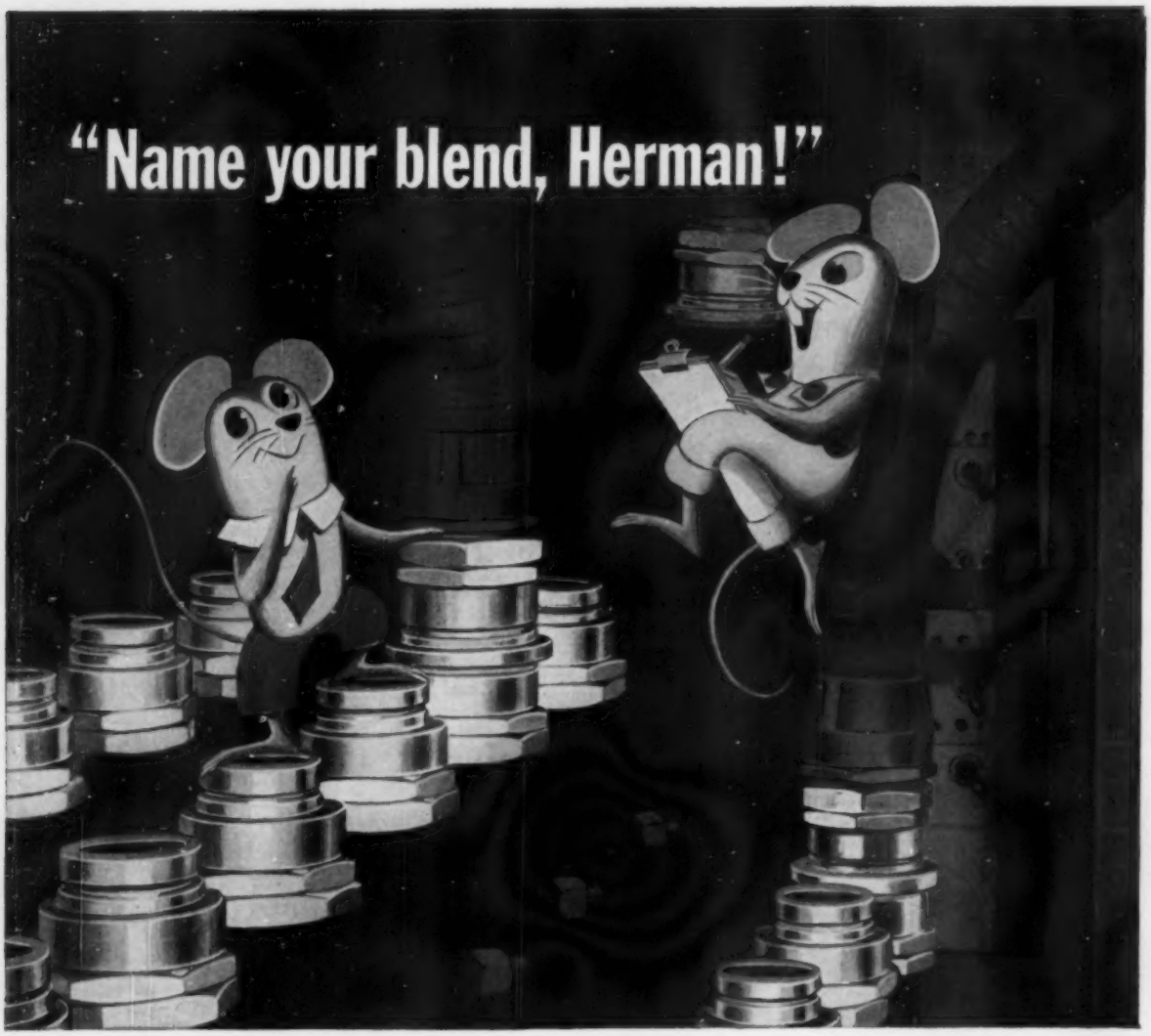

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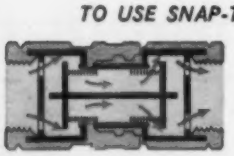

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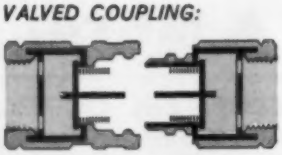

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WHAT'S JUST AHEAD IN THIS ISSUE?

- RECRUITING potential plant engineers can be a difficult task, particularly when engineering graduates generally are hired on the basis of their scholastic record alone. To get a better look at their future engineers, one company has a summer-job evaluation program that gives them a good look at the prospective employee, and gives the prospect a chance to evaluate the company. How does it work? See the next page.

- WOULD YOU TRADE your water tank for a deluxe swimming pool? That's what Flick-Reedy did in their new Bensenville, Ill., plant. The article "How Added Luxuries Cut Costs" also tells about other money-saving multiple-use features incorporated in one of the country's newest plants. It starts on page 104.

- SMALL PARTS HANDLING couldn't get much more involved than it does in a typewriter plant, where there are almost 2000 parts per unit of finished goods. How conveyorized handling of tote pans on a multiloop conveyor system is paying for itself in a year, is the theme of the article starting on page 111. The picture story should give you some good ideas.

- IF YOUR PLANT isn't completely secure you may be living in a fool's paradise. The article on plant security, beginning on page 118, points out the meaning of real security. The author, with years of experience in training and handling security police, tells what a guard force should guard against and how to choose the men who will best fit the job.

- WHICH POWER distribution system is best for you? There are several things to consider when you select a system to fit your specific requirements. To help you evaluate each of these facets, read the article "Power Distribution" beginning on page 123.

- MAINTENANCE FACTOR is important in efficient lighting. To find out if your lighting maintenance factor is high or low, compare your plant experience with the test results on page 130. These facts are based on a three-year study which considered lamp depreciation, lamp mortality and dirt accumulation.

- WHEN SAFETY EQUIPMENT isn't accepted by the people for whom it was provided, it's wise to find out why. At Monsanto, they appointed a committee of employees to design their own safety harness, and netted a double reward: built-in answers to the "gripes" of the users, and confidence in the safety device as a result of employee-run tests. For the detailed story, turn to page 137.

On-the-job EVALUATION OF POTENTIAL PLANT ENGINEERS

"The conscientious plant or maintenance engineer is constantly looking for new methods, materials and equipment to permit his organization to produce a quality product at the least possible price. He is aware that the profits enjoyed are directly proportional to his ability to supervise and maintain a group sufficiently qualified to accomplish this service. Thus the selection of the personnel comprising this group must be considered of major importance."

Wm Tunney, Jr.

Plant Maintenance Engineer
Zinc Smelting Div., St. Joseph Lead Co.
Monaca, Pennsylvania

Bill Tunney is well qualified to write on this phase of his company's engineer recruiting . . . he's a "graduate" of the summer-job evaluating program.

He has been with St. Joseph Lead at Monaca since his graduation from Carnegie Tech as a Mechanical Engineer. Starting as a Junior Engineer, he became Mechanical Field Engineer before assuming his present position as Plant Maintenance Engineer.

SELECTION of graduate engineers for positions in industry can be a risky, and thus costly, experience. Normally, a graduate is selected on the strength of a personal interview and his college scholastic and extra-curricular record. Based on this meager understanding, a company commits itself to retain the untried graduate for a period of evaluation and training (normally two years) at a salary that is now in the $500-per-month category.

Recruitment of these engineers for plant engineering positions requires additional effort. Few, if any, schools graduate engineers trained specifically for plant engineering, and many capable graduates do not enter plant engineering, because they feel this field of engineering endeavor lacks potential, challenge and professional status.

If we recognize that a problem exists, then the first phase of analysis demands a clear statement of the problem. In this case, perhaps the problem should be broken into three parts:

1. How can plant engineering groups attract top-caliber engineering students?
2. How can engineering students be given insight into plant engineering?
3. What program will permit industry to obtain maximum dollar value for the time and effort expended in the solution of the first two problems?

The Zinc Smelting Division of the St. Joseph Lead Company feels that the program they offer to selected engineering students is the answer to all three of the above questions. In essence, the program consists of the assignment of preselected engineering projects to the student. His project performance is then used as a basis for graduate recruiting considerations. The overall program is supervised and coordinated by a plant staff member.

This supervisor is responsible for the initial recruiting, the program organization and coordination, the general counseling, and the final evaluation. Each student is assigned a project which is supervised by a departmental staff member. Normal procedure is to assign a student to at least two different supervisors in order that a more thorough evaluation of the student may be obtained. The program is offered during the summer vacation months and is open to college students who have completed their Junior year.

Since its inception, the program has provided the Smelter with an economical means of recruiting and evaluating potential members of its organization, while at the same

time offering the student the opportunity to test his technical background on engineering projects.

Success of the program as a recruiting venture is evidenced by the fact that the two top management positions, approx mately thirty per cent of the departmental superintendents, and a large percentage of the technical personnel on the departmental staff are program graduates.

Evaluation at Lowest Cost

A summer-job program on the Junior Engineer level provides the company sponsoring the program an opportunity to evaluate a potential member of its organization at a minimum cost. It is important that the personnel organizing a work schedule realize the full impact of a "potential member" and also the economics of "minimum cost." Without this understanding, the company cannot hope to attain the greatest good from its program. Therefore, with this theme in mind, we will eliminate from discussion any specific advantages as such that the program offers the junior engineer, because, in investigating the facets of "minimum cost," we will see that a program built around it must, by its very nature, be of the utmost advantage to the student.

The broad economics of "minimum cost" are apparent. Instead of retaining a graduate engineer for two years in order to evaluate him, this same "look" is obtained at a lower salary and in a shorter time period. At this point, there may be some disagreement as to just what this "look" is worth to the company.

Naturally there are certain projects that the company would like to have accomplished. It would appreciate some concrete return for the salaries expended. This return on investment is fine, but not, however, important in attaining a thorough evaluation of the potential employee. In fact, if projects are such that their analysis and method of procedure are mechanical in nature, then it is very possible that little or no insight can be gained regarding the employee.

It should not be inferred from the previous statements that the students do not make a work contribution. On the contrary, in almost every instance the ratio of projects completed to projects assigned is unity. However, if a program is considered an evaluation period, then any work accomplished is "gravy." Thus, if we can eliminate the "return on investment" as a requirement from our program base, our chances of realizing a comprehensive evaluation have been increased considerably.

Each Engineer a Prototype

In evaluating any prototype, we are anxious to expose it to the worst possible operating conditions. If a favorable test run is experienced, we are reasonably safe in assuming that its future operation will meet with our requirements. In a sense, each junior engineer is a prototype. He has been shaped and engineered, both technically and psychologically, to fulfill a certain need. The prime purpose of the program must be, then, to determine by trial whether or not his qualifications meet the company's standards. This determination may best be arrived at by observing the individual's attitude, application, enthusiasm, ingenuity and versatility under conditions that are challenging in nature.

It is important that the projects be challenging both from the standpoint of the company and the junior engineer. Most good men are at their best when faced with problems that somewhat tax their abilities. In such a situation, the individual must call upon all his present resources and, when finding these to be insufficient, must endeavor to acquire additional to meet the challenge.

Acquiring these additional faculties is often a time-consuming job. This is one of the reasons why it is important that the "return on investment" theory be given secondary status. More can be learned of a man in his attempt to acquire and apply new or modified principles than if he merely works in rote manner with knowledge at his fingertips. The advantages to both the company and the individual are evident. The company sees the man's potential under trying conditions; and the individual can show his initiative at its best while, at the same time, gaining valuable experience.

Select the Right Assignment

The selection of proposed assignments is perhaps one of the most important responsibilities of the program organizer. The results he hopes to attain will be directly proportional to the time he expends in analysis. Since, for the most

Fig. 1. Counseling sessions are important to the program, for discussion of work progress and evaluation of student potential as company employee.

part, the junior engineers will be receiving their baptism in industrial problems, some means should be established between projects that are frustratingly challenging and others that are challenging yet are not too far from the level of the individual. A feeling of self-confidence tempered with the knowledge of his inadequacies will surely come as long as his project shows progress and will do a great deal to motivate him toward accepting future challenging problems. Stagnation and complacence are often the results of youthful frustration, and neither has any place in the makeup of an engineer.

Equally important in the selection of projects is the contribution the project will make to the plant. Projects should be assigned that will not only permit adequate evaluation, but also are necessary to increase or maintain plant efficiency. The student is apt to take a dim view of projects designed merely to keep him busy and which have no economic implication to the company.

Plan a Full Schedule

The period spent with the company by the junior engineer is his summer vacation time. However, this vacation should not be spent during the normal working day. There is danger that, because of waiting on materials, completion of a project, or insufficient program planning, the individual may find himself "in-between" projects for a few days or a few weeks.

Since the period of evaluating a junior engineer is short to begin with, any further reduction in time is a decided disadvantage to the company. Furthermore, inactivity does not commend the company to the student. Preliminary time spent in formulating and analyzing enough projects to more than fill a three-month period is a must. A typical summer program assignment is shown in the box on the facing page.

Routine Assignments "Fill In"

Not all of these assignments must be challenging in nature. Routine work continues despite innovations and development. At the risk of being contradictory to prior statements, there is a definite value in interlacing routine assignments with the more formal projects. A few assets of this work arrangement are:

1. "In-between" lost-time is eliminated.
2. The junior engineer is required to keep a few "irons in the fire" at the same time (standard procedure for any staff member).
3. The workload of the department to which the junior engineer is attached is relieved.

These assignments need not be planned prior to the commencement of the summer program, but should be allotted as the need arises. They should, however, be screened in order that what is normal routine for a departmental staff member does not become a major project for the inexperienced junior engineer.

How Much Supervision?

Possibly the greatest stumbling block to a venture of this nature is the reluctance of an organization to release qualified supervisors to conduct and evaluate the program. Surprisingly enough, once the program is past the planning stage, the amount of time a supervisor devotes to a student assigned to him is small. In fact, the junior engineer should be permitted to handle as much of the project as he is capable of doing and use his supervisor only as a consultant. This feature is mutually beneficial. It releases the supervisor to continue his own work while placing the student in the position of being an engineer rather than an engineer's helper. The psychological impact that is associated with this supervised independence may well prove to be the strongest selling point a company has to offer.

Modern competitive industry requires capable progressive personnel on its staff. Thus, the care employed in recruiting and evaluating engineers may well decide an organization's future ability to successfully compete. **End**

Fig. 2. Junior engineer checks water temperature at plant's reclaimed water spray pond, as part of smelter water survey.

Fig. 3. Seminars provide students with an opportunity to discuss their assignments, lead sessions, learn from others.

TYPICAL ASSIGNMENT SEQUENCE for Junior Engineer During Program

PRIOR to the junior engineer working on any assignment, his supervisor discusses it with him in detail, providing any pertinent information he should have at his disposal. If the assignment requires him to contact personnel with whom he is not acquainted, the supervisor introduces him to the concerned parties. After the preliminaries have been resolved, the junior engineer takes charge of the project, with his supervisor serving in a consultant capacity.

ASSIGNMENT NO. 1.

Design monorail system to facilitate removal of acid pumps from 98 baume H_2SO_4 storage tanks.

Supervision: Plant Maintenance Engineer

Scope: An assignment of this nature requires the junior engineer to work first hand with the area maintenance and operating personnel to assure his complete understanding of the requirements, service and limitations. After a thorough understanding is obtained, he designs a proposed installation. This design is reviewed by his supervisor to assure accuracy of strength calculations, economics, safety and practicality of fabrication in the plant shops.

When a design has been agreed upon, the junior engineer then details a set of prints suitable for fabrication and erection. He is further required to make arrangements with the fabrication shop and the erection crew for all labor and materials necessary to complete his assignment. While the junior engineer will continue with additional assignments during the fabrication and assembly of the monorail, it is still his responsibility to maintain a close contact with this assignment until its completion.

ASSIGNMENT NO. 2.

Conduct efficiency tests on specified vacuum pumps and air compressors.

Supervision: Assistant Chief Engineer

Scope: The junior engineer outlines procedures for evaluating the efficiency of selected vacuum pumps and air compressors by means of a thermodynamic analysis. After his supervisor approves the procedures to be used, the junior engineer designs or specifies the measuring apparatus necessary to conduct his tests. All arrangements for fabrication, installation and scheduled shut downs are the responsibility of the junior engineer.

This particular assignment involved the relative comparison of two different styles of vacuum pumps. Not only was the student required to perform the thermodynamic analysis, but he also compiled an economic report based on maintenance costs, production loss due to down time, oil consumption and power consumption.

ASSIGNMENT NO. 3.

Establish procedures, based on an engineering study, to reduce the consumption of raw water and maximize the use of reclaimed water.

Supervision: Plant Maintenance Engineer

Scope: This assignment was one phase of a major evaluation of the smelter's raw and reclaimed water systems. Due to the work involved, two junior engineers were assigned to the survey.

They were asked to determine:

1. The correct water flow requirements for every unit in the smelter (this includes cooling towers, wash basins, compressors, etc.).
2. The condition and temperature of the water as it leaves the unit.
3. The destination of the water as it leaves the unit.

Based on these findings recommendations were to be submitted that would become the foundation of an actual water conservation program.

The determination of actual water flow to or from the units presented a wonderful opportunity to evaluate the students' ingenuity. The men used every conceivable means they could think of to accomplish the job quickly and accurately.

In its entirety, the assignment required mathematical calculations, engineering record searches, ingenuity, hard work and a practical approach to the requested recommendations. The indicated results were so gratifying that plans for additional well capacity (cost $40,000) were cancelled.

Periodically, seminars are held with all the students and their supervisors in attendance. During the summer program each man is required to give one fifteen-minute presentation on some phase of his project assignment. These seminars enable a number of supervisors to evaluate the man's ability to effectively compose and present an engineering paper. Also the discussion period provides the junior engineer with an opportunity to "think on his feet."

Fig. 4. Supervisors assist junior engineers at any stage of the program. Here, conveyor line change is discussed during design on drawing board.

SETTING UP A CONTROL SYSTEM?
This Plant Engineer's Approach Can Help

From initial idea to actual installation and post-installation reporting, the plant engineer can play an important part in eliminating all possible "bugs" in a control system

MANY plant engineers far removed from control design engineering may be surprised to find that control system manufacturers consider them key figures in obtaining efficient monitoring of high-speed machinery.

Actually the plant engineer's intimate knowledge of plant operations is highly important to the control manufacturer. This was an experience of the Sterns Control Corporation when they installed a control system in a container plant.

Here is a brief description of the problem the container people had and what was done to correct it. The machinery was originally designed to form containers with identical ends, top and bottom being indistinguishable. In this situation orientation of the containers on the line was unimportant.

Problem and Solution

But then a new container was introduced, with the top of the container completely different from the bottom. Now it was essential that the label be right side up and any improperly assembled container had to be eliminated from the line to avoid the possibility of shipping imperfect units to the customer.

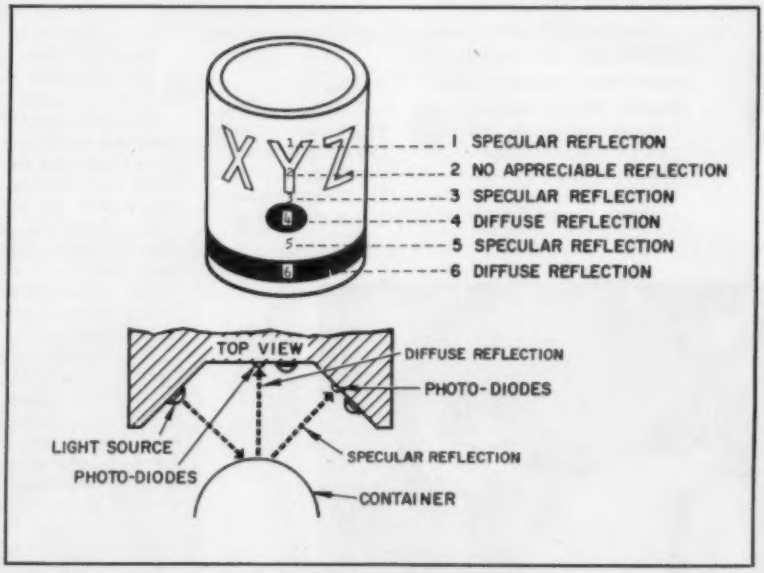
Following the installation of this new equipment, the container company began receiving complaints from customers, rejecting shipments because the percentage of imperfect containers was too high.

It was up to the plant engineer to find the trouble. After experimenting, he learned that the speed of the operation was too high for the human monitors employed to control the operation. He proposed that an electronic control system be designed to accomplish the required quality control.

Controlling an operation of this type required a photoelectric code continuity selector able to recognize a given code and point out any improperly assembled unit on the line. This was to be done by registering the code only when a unit was in the proper position; the code would not be registered when a unit was out of line.

The code selected was the can label. This presented two complications. First, label colors and designs are chosen to attract the consumer's eye and not because they are easily recognized by an electronic control system. This meant that the system must not be confused by subtle variations in either color or design.

Secondly, from the standpoint of



By placing container in front of code detection head (bottom sketch) and testing, it is determined that six different reference points running through the letter Y will provide the specific reflection pattern shown here. This pattern becomes the code and is "locked in," meaning that any unit going down the line which does not conform to this established code will be detected and eliminated.

economy, installing a system to function with just one type of container and one specific code was out of the question. The system had to be adaptable for use with many different types of containers.

The system built to meet this problem consisted of a series of 12 photocells and six light sources using a reflection-type principle. The photocells were mounted to pick up either diffused reflection or specular reflection from the surface of the cans. The theory of operation of this system was based on the number of combinations obtainable with a given number of photocells. In this case it was determined that 12 photocells made possible a sufficient number of combinations for proper detection of the various types of labels involved.

In many instances the plant engineer's involvement would end right here and he would hear nothing more until the control system showed up on the machine. Yet if the plant engineer is to get full benefit from the control system in terms of more efficient operation and minimum maintenance, he should know something about the key stages in the systems development. By being in on the planning the plant engineer can help the manufacturer avoid headaches for both of them.

Again an example from the container operation mentioned above: In designing a control system for this container-forming operation, it was originally proposed that a special attachment be added to the machinery to assure proper orientation of the containers as they passed the control. This was to have been an attachment that would grasp each unit as it passed by the selected point and turn it to a pre-determined position in which the label, or code, would always be in an exact relationship to the detector.

Spot for System Located

But it was learned from the plant engineer that it was not necessary to go to the trouble and expense of building a special attachment for this purpose because at certain locations on the line there was already perfect orientation of every unit. In other words, in certain spots there was never any variation in the position of each unit coming down the line.

Thus the problem was not building a special attachment but determining which of several "perfect orientation" locations was the best one for the control system.

One of these locations was the bodymaker, where the flat tin sheet is formed. Up to this point the product is a flat, lithographed sheet; after this point it is a formed container body. Every piece of flat metal is bent in exactly the same way and the position of the label never varies. Here was the logical place for the control system.

But this location was chosen not only because of the proper orientation factor. It was selected because it also met certain other considerations which should be taken into account in determining location. These are:

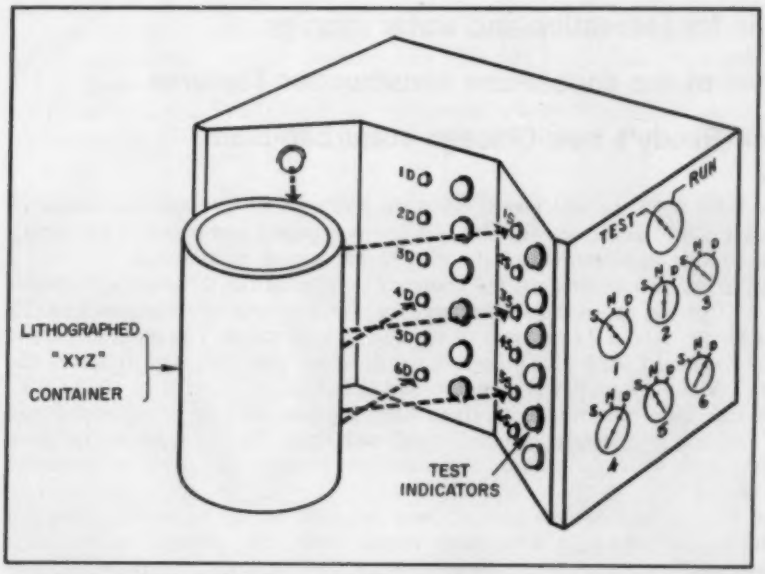
1. Is there enough space for the control system in the spot selected? If not, the location is obviously improper, even though it may be one spot on the line where perfect orientation is possible.

2. Is the location selected one where the control system will cause the least hindrance to the machine operator? If the system is going to get in the operator's way at this point, obviously this is not a good location regardless of other, favorable factors.

3. Is the location selected logical from the standpoint of the various phases of the operation? If it is located at a spot that is fairly "early" in the operation, will there be opportunities for disorientation of units further down the line? If so, then obviously the control system does not belong here because it could not pick up problems that might develop later. Ideally the system should be placed in a location where all the faults and disorientations that could possibly occur during the production process have already occurred and will be detected by the control.

Post-installation information can also prove of value to both the user of the control equipment and the manufacturer. Here, the plant engineer can help by reporting to the manufacturer just how the system is performing so that any necessary adjustments will be the right ones.

No two production lines are exactly alike. There are no standard solutions to control problems. By keeping the control system manufacturer fully informed about conditions in his particular operation, the plant engineer can help obtain a control system designed not for a non-existent "typical" situation but for the specific requirements. **End**



A more detailed view of the code detection head shows a container being tested to establish the code. This control system is flexible and can be used with a large number of different codes. Should production switch from the present container manufacture to some other type, a new code can be established and the control system can be adjusted to recognize an entirely different label.

HOW ADDED LUXURIES CUT COSTS

Swimming pool for fire protection, landscaped lagoons for recreation and water storage just two of the double-use construction features of Flick-Reedy's new Chicago suburban plant

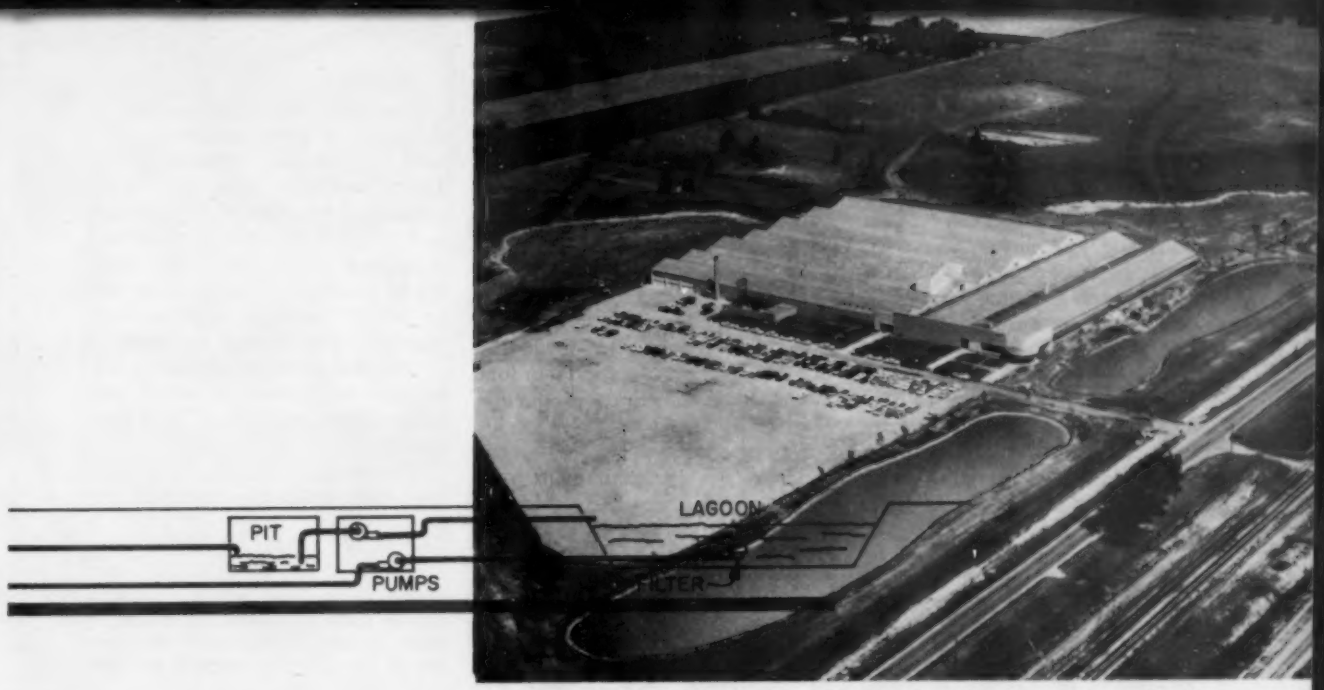
ECONOMY WAS the watchword when the Flick-Reedy Corporation started its "dream plant" in Bensenville, Ill., yet few new plants can match it for luxury features, striking appearance and attention to the human relationship.

Acting as its own contractor, the company completed the 220,000 sq ft building for $10 per sq ft—normal minimum for Chicago area construction runs 25 per cent higher. About 24 per cent of the cost was electrical. The plant has about 6000 hp connected load with provision for a 50 per cent increase. It serves the company's Miller Fluid Power and Tru-Seal divisions.

A 94-acre tract improved with three large lagoons, 650-car blacktopped and lighted parking lot, sewage disposal plant and seven acres of automatic lawn sprinklers, plus plant furnishings and furniture brought the price up to about $12.70 per sq ft.

Many double-duty design features were adapted to the standard type rigid steel building to help hold down cost. Paradoxically, the greatest savings came from such rare luxuries as 600-ft-long landscaped lagoons, tiled interior swimming pool with deluxe appointments and surroundings, and one of the world's largest heat pumps to supply year-round air conditioning.

After five months, Forest G. Niccum, vice president, reported production up nearly 50 per cent and absenteeism down to a record low. The personnel hiring



Far left is photo of swimming pool. Drawing in color shows water collection system that drains into the lagoons. Above: aerial view of plant and lagoons.

problem had vanished. Most credit was given to the manner in which the company solved its expansion problems and stepped up its already strong employee relationship.

Big Savings on Water

An industrial water system which is practical for many moderate to heavy users in areas of at least average rainfall developed into one of Flick-Reedy's biggest money savers. Insurance sprinkler requirements called for a $160,000 water tower and a $120,000 hookup to the Bensenville water district two miles away. Insurance underwriters, however, accepted, as satisfactory, the rainwater storage system for a new saving of $148,000. Construction of lagoons and swimming pool, and installed cost of a pressure tank pump system totaled $132,000.

Capacity of the two 60 by 600-ft lagoons is 3,800,000 gal and of the pool 93,000 gal, enough to care for considerable future expansion in a plant designed for 120 gpm water use 10 hours daily. Rain water collected on the plant roof and parking areas (about 10 acres) is drained to lagoons at rate of about 350,000 gal for each inch of rainfall. Average annual fall for the area (37 in.) indicates the system would receive about 12,950,000 gal yearly.

Daily use of the system brings more savings. Lagoon water costs three-quarters of a cent per 1000 gal, compared to 75 cents for the village water, with no reduction in price for quantity consumption. On a 120 gpm basis for 10-hr day, 260-day year, annual use would total 18,720,000 gal. Village cost would be $14,040 compared with only $140.40 for plant cost. And with 60 per cent of the water routed back to the lagoons for reuse, only 7588 gal would have been lost.

In practice, the plant has been averaging about 80 gpm based on 120 gpm maximum for four summer months and 60 gpm for the remaining eight months. Thus its yearly use based on a 10-hour day is 12,480,000 gals. The cost: $93.60, representing net annual saving of $9,266.40 over village water cost.

The company has found still an-

View across auditorium showing cathedral-type ceiling. Sliding doors open into cafeteria to take overflow. Room doubles as recreation room.

ADDED LUXURIES CUT COSTS

other water bonanza. Designer Norman Steenhof of Zay Smith & Associates, architects, reports: "When lagoons and pumping system were constructed it developed we had an underground spring condition. A well point system was installed in this area which delivers approximately 1800 gph, 24 hours a day, 365 days a year for a total of 15,768,000 gallons. When this was discovered, it was decided to divert all remaining water used in plating operations to the storm water ditch.

"This extra unexpected gallonage merely means that we will not be required to catch all of the rain water through our pumping system and will divert any excess to the storm water ditch."

Dependent on savings, it would appear that most water users of at least 80 gpm could amortize the cost of the extra two acres or more within five years if the price was at or near the 40¢ per sq ft level prevailing near the plant.

Basic Building Little Changed

Standard "pre-engineered" steel building units of the Butler Manufacturing Co. were used by Flick-Reedy with only three exterior changes made to emphasize the custom look. Part of the structurals were cut back at the entry to make way for a 32-ft-diameter circular canopy comprising 65 tons of steel and concrete; a high parapet wall was erected on one side from lobby to the plant area, and an 8-ft addition was attached to the front of the building to contain a window-wall corridor and to widen the cafeteria.

This particular building system was chosen because the structural units bolt together quickly, provide 60 and 70-ft clear spans, and eliminate all need for bearing walls and partitions. Insulation required on all outside walls favored use of brick or stone cavity walls generally; in some places such as gable ends, Butler insulated curtain wall was installed.

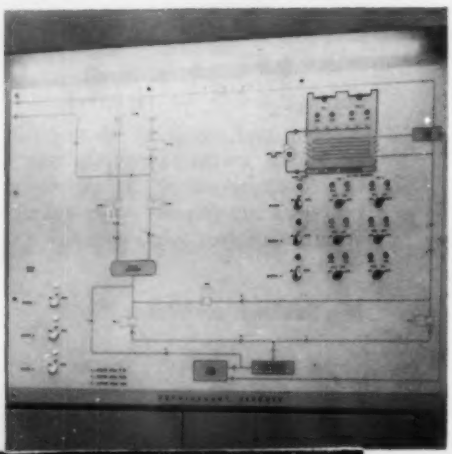
To get the same low rate of insurance with more conventional construction, solid bearing walls would have been required to divide the 148,780 sq ft plant section into four rooms, interfering with production flow.

Among double-use features in the building are the aluminum roof which helps to keep out intense summer heat. Roof drain system connects with parking area drain to collect rainfall and prevent flood damage; swimming pool which stores water for fire protection also is used for research and is open to all employees, their families and friends; quarter-circle entry hall which combines display lounge and lobby use; large auditorium which is equipped for company or community meetings and employee recreation; cafeteria which can double size of auditorium when wide sliding door is fully opened; new-type loading platforms which give company the opportunity to display and promote its own new hydraulic lift cylinders.

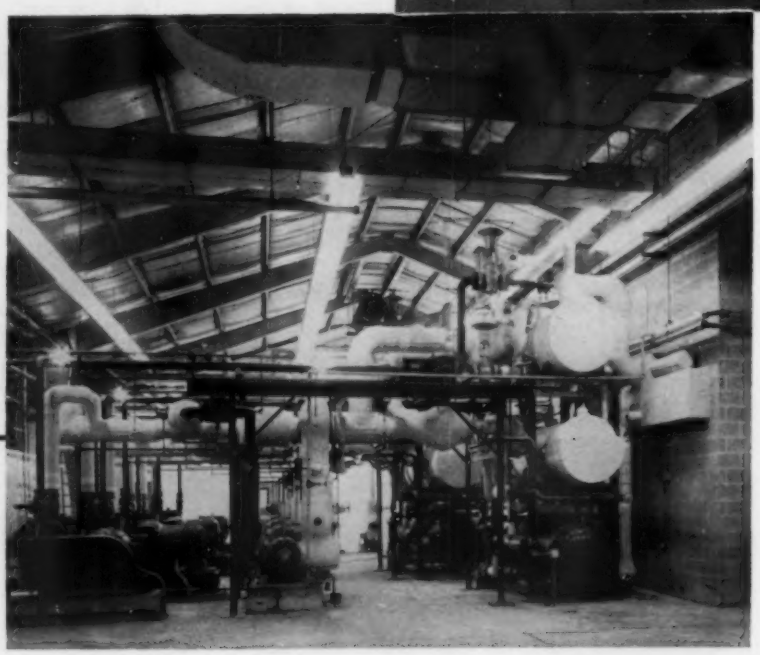
After a year's operation, the heat pump was found to be more efficient than anticipated. Installed several months before completion of the plant, it comprises three complete compressor systems, each with a two-stage cycle, for a total capacity of 640 tons of refrigeration or 5,506,000 Btu per hr of heating at extreme design conditions. Heating or cooling is transferred to water which circulates to coils of air handling units through the plant.

"We find we're getting hotter water than we planned in winter, and colder water in summer," said Niccum.

The complete system, he pointed out, cost $540,000 installed, or



Heating-cooling panel offers individual or fully automatic operation of each system. Compressor controls are at the left, air controls at right.



General view of air-source heat pump with three complete compressor systems cross-connected for improved efficiency. Defrosting cycle presents no problem; two units are sufficient to heat or cool the building most of year.

Glassed-in corridor, over 300 ft long is actually an 8-ft wide addition to front of the plant. Aluminum sill-planter conceals heat pump delivery.

THESE, TOO, WERE COST-SAVERS

PURE VINYL floor tile with a terrazzo-like pattern was installed throughout the office section for about 75 cents per sq ft. This was about three times greater than the installed price for asphalt tile, but the saving in wax alone will pay for the vinyl within three years. No wax is used—only steel pads and a dry powder conditioner to buff out marks.

ALL EXTERIORS brickwork silicone treated at extra cost believed to be more than fully regained through anticipated savings in tuckpointing.

A FOAM RUBBER underlayment was installed in floor areas subject to more than normal walking, such as the file room. Clerks don't get tired feet so easily.

STEEL FRAMING for the plant area was specified strong enough to take overhead cranes with up to 3 ton capacity in the 50 ft spans, or 1 ton in 70 ft spans, without a change.

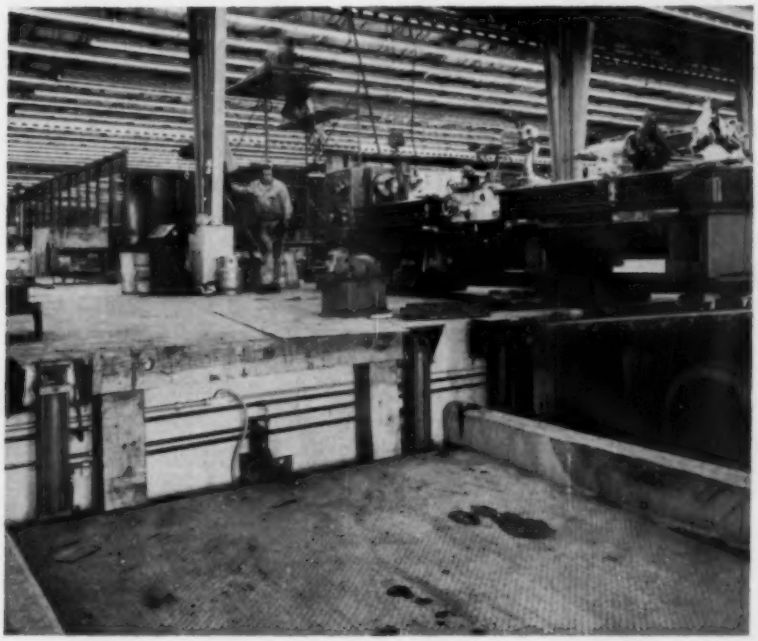
THERE WERE no bearing walls required and nearly all walls were built of a lightweight block with an expanded slag aggregate. These walls were ground-faced at an extra cost of a penny per block so that they would take paint better. This permitted use of various catalytic plastic paints with long-lasting qualities.

IN AREAS where acid is used, block was treated with an epoxy coating at a cost of 10 to 40 cents more per sq ft than normal paint. Spray glazes were applied to walls in corridors and washrooms; cement enamels in cafeteria and auditorium.

PLANT LIGHTING was placed on a modular basis. Space used only for storage now uses every other lighting fixture for 20 foot-candle power. When needed, other fixtures can be turned on to increase lighting to 55 or 50 foot candles. And the necessary wiring is in place to go to 120 foot candles at any time, merely by adding the extra fixtures.

SEMI-AUTOMATIC truck loading docks were fitted with a new invention worked out by Flick and the designer's office, to speed loading operations. Trucks are actually hung on two little 5-in. cylinders, eliminating all need for either a pit or heavy hydraulic cylinder.

Loading platform demonstrates adaptation of company's new hydraulic cylinder attachments designed by its president, Frank Flick. Hinged rear section can be raised or dropped.



about 10 per cent more than a conventional heating system with separate air conditioning units, but power cost of the heat pump was estimated to be more than $5000 a year less than power for the conventional system plus fuel cost. "And, he continued, "we have a contract with the manufacturer (York Corp., a Borg-Warner division) covering all maintenance, repairs and replacement parts.

"We suffer no inconvenience while the heat pump is 'down' for maintenance. We have three compressor systems but we need all three for but ½ month of the year —that period when outside temperature is below 15 deg F. Last summer, because of the comfort factor, we had considerably less absenteeism. The fellows wanted to come to work instead of sweltering at home . . . a factor in our improved production." **End**

INDUSTRIAL TELEPHONE SYSTEM SPEEDS SHOP COMMUNICATIONS

Eight manhours are saved during each eight-hour shift . . . That's what this system did for a 75-employee plant. Cost: $45 per month

WHEN AIRLINE WELDING and Engineering Company erected its new, ultra-modern plant at Gardena, California, Byron R. Russell, president and owner, decided to simplify shop communications and save the thousands of steps normally expended each day by employees in merely passing information from one point to another.

To do this, he installed an in-plant telephone system, with 30 telephones located at strategic points through the shop area. The equipment was leased from the telephone company so no capital outlay was required. Similarly, the telephone company will maintain and repair the system when and if it is required.

The telephones are all connected to an automatic switchboard so that mere dialing obtains the wanted number elsewhere in the shop. Outside calls can be made only by dialing company's main switchboard.

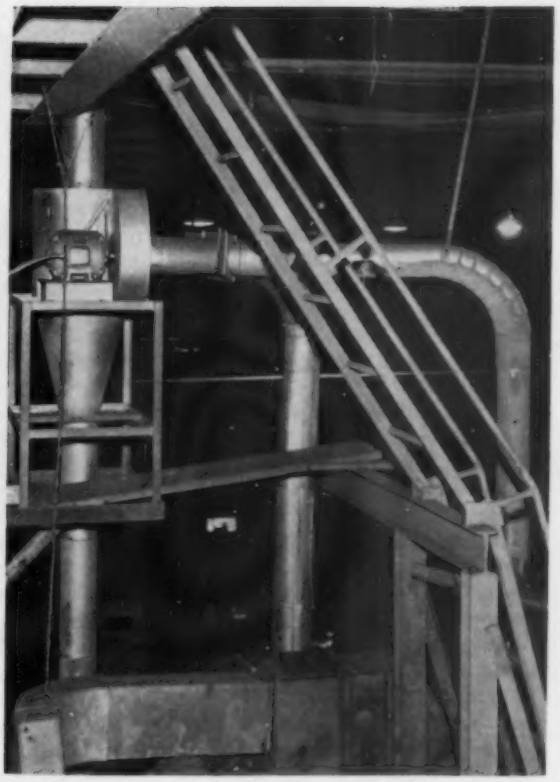
Where possible, the telephones are mounted on a wall. In other cases they are merely hung on some sort of building upright, or even an upright structure extending from a machine, but in a position so they are most convenient to the area they serve.

Russell points out that main use of the telephones is made by production control in checking on the progress of work flow. But the value of the system in allowing any individual employee to order tools or additional material from the stockroom cannot be minimized. Then there are numerous and varied necessary in-shop information exchanges which, minus the telephone system, would cause the employee to leave his work area and go to another portion of the plant.

The telephone system is supplemented by a plant-wide intercom system. While there are no physical connections between the two, Russell explains the value of the combination in this way. . . . "Maybe I telephone the superintendent and he is not in his office. Then I have him paged on the intercom, and he can telephone me from wherever he is in the plant."

By Russell's own estimation, the telephone system saves 8 man-hours during each 8-hour workshift . . . this despite the fact that there are only approximately 75 employees at work. **End**

Major source of dust was the shot elevator. This photo shows dust collection system installed above it.



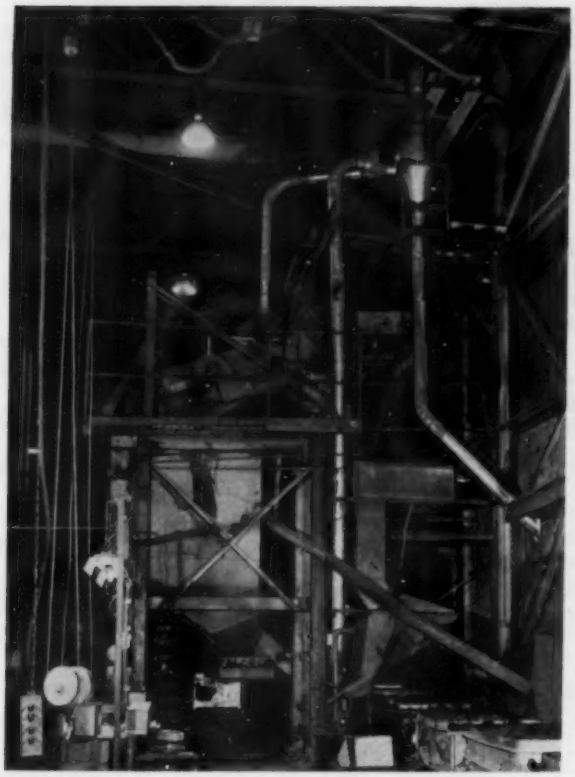


Photo at left is over-all view of dust collection system. One suction duct removes dust from the top of the shot storage hopper. The other removes dust from shot buggy discharge chute at the elevator boot.

PLANNED VENTILATION SYSTEM—

1. Improved plant comfort conditions
2. Cut down air pollution
3. Upped combustion efficiency
4. Lowered machine maintenance

By ERNEST M. STOLBERG, Plant Engineer
The Commercial Shearing & Stamping Co.
Youngstown, Ohio

IN AUGUST, 1956, our company, The Commercial Shearing and Stamping Company of Youngstown, Ohio, expanded its foundry operations. This meant the construction of a new, totally enclosed building without windows or natural ventilation. Roughly, the building was divided in two parts, operationally speaking, one half of the space being assigned to the foundry operation and the other half to machining operations closely associated to the casting produced in the foundry and also to related operations on hydraulic cylinders.

Foundry equipment consists of sand hauling and mixing machinery, an automatic shell mold machine,

high frequency electric furnaces, a steel shot elevator, a blast cleaner, dust cyclone and ductwork, materials handling buggies and equipment and miscellaneous associated equipment.

During the winter, occupants of this building, as a result of a partial vacuum induced by considerable exhaust from the foundry operation, suffered from severe drafts whenever doors were opened. In addition the equipment, which depended in part on combustion processes, operated at reduced efficiency. Furthermore, dust was beginning to accumulate on the ways and guides of some of the machine tools close to the foundry area.

After studying the problems during all seasons of the year, except autumn, it appeared to me that the problem was made up of several elements. The first element was the vacuum in the building—during the winter months. This vacuum was caused by the exhausting of building air according to the following table.

1. Shell mold blower	48,000 cfm
2. Mold sand cyclone	3,000 cfm
3. Shot elevator exhauster	4,000 cfm
4. Wall fans (east wall)	
No. 1	29,000 cfm
No. 2 disconnect in winter	34,000 cfm
No. 3 disconnect in winter	34,000 cfm
5. Kolene exhauster	2,500 cfm
6. Snagging grinder exhauster	minor
Total	154,500 cfm

When allowance was made for disconnection of two of the wall fans in the winter, a total exhaust of 86,500 cfm was in effect during the cold weather period. This meant that in order to eliminate drafts due to building vacuum an equal or slightly greater volume of outside air had to be introduced into the building.

In this building are three gas-fired space heaters. One was located at the north end, one at the south end and one at the southwest building wall. Past practice called for recirculating most of the internal air through these heaters for air tempering and to pick up approximately 30 per cent through the outside air louvers.

It was my recommendation first to transfer the heater from the north end of the building to about the middle of the east wall. In addition, the recirculation dampers would be sealed shut and all air intake would be from the outside. These heaters are each capable of handling 15,000 cfm of air for tempering from 25 F to 65 F, or a total outside air intake of 45,000 cfm, all of which can be heated.

In addition, we installed a blower to bring in an additional 40,000 cfm of air. This blower was mounted above the shot elevator where the incoming cold air was tempered by induction at high level from the heated air in the foundry pour section.

The balance of approximately 1500 cfm has entered through the outside louver previously serving the heater which was removed from the north end of the building. Since there are seldom any personnel working directly in this area except when sand is being delivered, air entry at this point offered no special discomfort. To make it even less objectionable, what air did enter was tempered by two Schwank gas-fired infrared units located above the truck door opening.

Another element of the problem was dust which seemed to be associated largely with the shot elevator operation. Other lesser sources of dust were the sand mixer, the snagging grinders, the shell mold machine and the cyclone—all of which are exhausted to atmosphere.

After reviewing the various methods of dust collection and removal, the following method of attack was chosen.

1. Vacuum cleaning of all surfaces where dust had accumulated —as far as was practicable.

2. Repair and seal, as far as possible, the sources of dust contamination—and maintain in good repair.

3. Insure that all dust removal systems were fully operational at all times.

4. Install an additional collection system over the shot elevator with one suction duct over the inlet screen at the top of the shot storage hopper and one at the shot buggy discharge chute at elevator boot.

We had considered several alternatives before taking this course. None of these proposals ran less than $7800.00 and would have cost us $20,000.00 installed. It is doubtful if some of these proposals would have been effective and fully satisfactory.

This installation was completed just before Thanksgiving of 1959. A tabulation of our costs follows.

Cost Tabulation

1. 40,000 cfm blower	$985.00
Blower outlet nozzles	152.00
Intake ductwork and wall louver	460.00
Vibration isolators	62.00
Steel access ladder & platform	200.00
Installation labor	
1 Rigging	360.00
2 Welding, millwrights, electricians painters	350.00
2. Dust collector plus associated metal ductwork	690.00
Installation labor	
1 Electricians, weldors, pipefitters	250.00
3. Moving space heater	
Rigging	165.00
New stack, intake louver and transition piece	490.00
Installation labor	275.00
1 Stock handlers	
2 Pipefitters, electricians	
4. Two infrared gas-fired heaters	442.00
Installation cost	
Pipefitters and electricians	75.00
Total	$4956.00

The entire installation has been working effectively since it was completed. Our management is satisfied because a nagging problem has been solved at a reasonable cost. Our employees are satisfied because an irritation has been removed. Our equipment is satisfied because it does not have to strain under a vacuum and because its surrounding air, while still somewhat dusty, is at least 50 per cent cleaner. **End**

CONVEYORS SMOOTH PARTS FLOW

Loops, dispatch stations, automatic accumulation and reversible conveyors keep parts flow geared to production needs

By J. M. CONNELLY, Plant Engineer, Royal McBee Corp., Springfield, Mo.

Fig. 1. Over 50 automatic screw machines are serviced by this conveyor. Parts are conveyed to weigh-counting stations, or to wet or dry tumbling.

Fig. 2. This conveyor services blanking presses. Parts in tote pans are fed by conveyor into dry tumblers. Strategically located stiles permit traffic flow.

TOTE PANS . . . 7500 of them, to carry typewriter parts . . . almost 2000 for each portable typewriter we produce . . . play key roles in the production facility recently put into operation by Royal McBee Corp., in Springfield, Mo. Obviously, moving these pans and parts around the 266,000-sq ft manufacturing plant was an interesting material handling problem during the design of the plant.

The experience gained at our Hartford, Conn., plant, by the engineering staff assigned to lay out the new plant, enabled us to show that conveyorizing our operation would result in considerable savings in handling costs. In an operation of this scope (our plant is the world's largest production facility devoted exclusively to the manufacture of portable typewriters) the moving of thousands of small parts, through the many operations required for each, represents a sizable portion of production costs.

Actually, our studies showed that the installation of conveyor systems in the new plant would pay for itself in one year, in savings over other types of handling systems.

So, from screw machines and blanking presses, conveyors carry parts, in tote pans, through cleaning, drilling, tapping, tumbling and plating operations, to finished parts storage prior to their assembly into

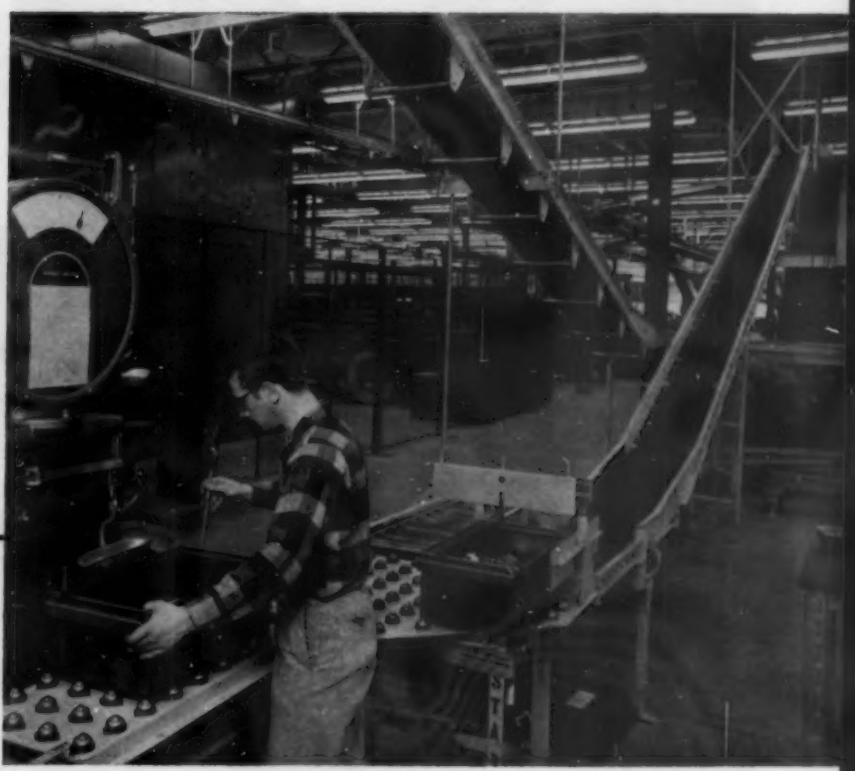
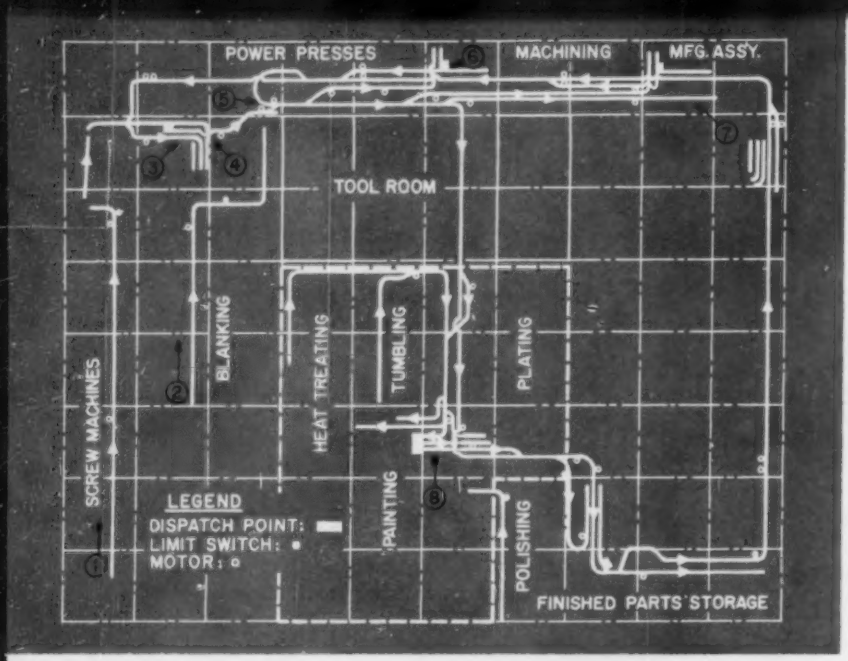


Fig. 3. Station No. 1 in system. Parts are weigh-counted and pins positioned to direct pans to correct destination. Pin guide above pan (right) prevents dispatch of improperly pinned pans.



Sketch above shows layout of manufacturing conveyor with dispatch points, drive motors. Numbered arrows indicate camera positions, Figs. 1-8.

CONVEYORS SMOOTH PARTS FLOW . . .

the product of our plant, portable typewriters.

One major component in the system is the manufacturing conveyor. It is a pin set controlled, belt and roller conveyor system, combining belt, gravity and live roller components. It was designed to our requirements, built and installed by the Alvey Conveyor Manufacturing Co., St. Louis, Mo.

In the pin set system, placing of dowel-shaped pins in holes drilled in racks mounted on the ends of the tote pans directs the pans as they travel along the conveyors. They can be shunted off the conveyor to stations along the way, as required by production activity.

The conveyor system at Royal McBee is designed to perform three basic functions:

1. carry tote pans of parts from work or storage areas to subsequent work areas, through inspection and weighing stations.
2. provide control of tote pan movement from any sending station to any receiving station, and from the main loop to receiving conveyors.
3. provide automatic live accumulation of parts from the main loop to a given receiving station, so that receiving station operators need not attend the conveyor constantly.

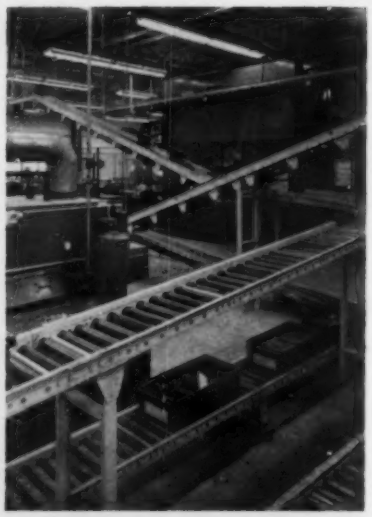


Fig. 4, right. Parts or pans to be washed are returned to this area. Pans can accumulate, off the main line. Pan washer partially shown in background.

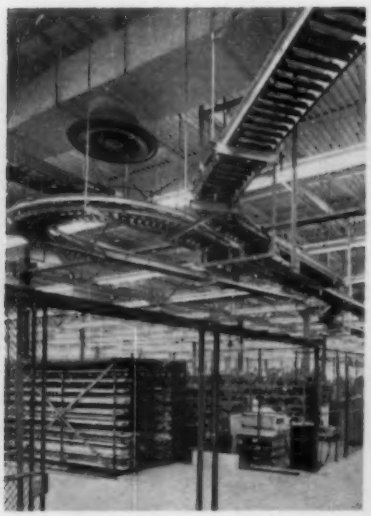


Fig. 5. Transfer center. Pans move from punch press and machining areas, from cleaning to finishing areas. Parts from tumbling switch into system here.

Fig. 6. Secondary machining area station. Conveyor deck (left, overhead) carries pans to finishing area. Pan in foreground contains McBee Keysort cards for production control of parts.

Designed as a closed loop system, with three loops within a major loop, the traffic on the system is not limited to one direction. Tote pans, loaded or empty, can be sent in either direction on the surge loops within the main loop.

Each of the live roller surge conveyors in the system permits relief from congestion in the main loop, should tote pans "pile up" for any reason. The surge conveyors can absorb pans so that only short sections of the main loop are affected by abnormal loading.

Final conveyorized operation in the system is the movement of finished, packaged Royal portable typewriters from the packaging machine to warehouse storage. A vertical conveyor, also designed by Alvey, is used to transfer two portable typewriters at a time, from the overhead gravity conveyors fed by the packing machine to a gravity roller conveyor at working level, from which the cartons are palletized for storage.

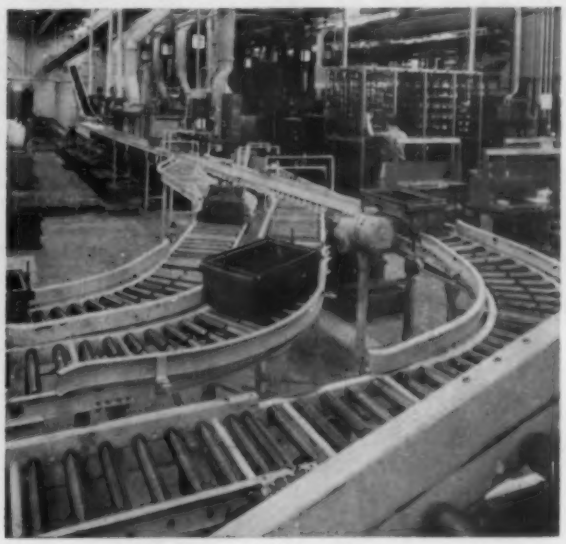
The picture series shown here points out many of the features of the conveyor system. **End**

Fig. 10, above right. Packaged units ride overhead conveyor to vertical lift. Unit accepts two cartons, moves them to lower level for transfer to pallets.

Fig. 9, right. Packaged typewriters leave sealing machine. Tipped on side, they move up incline conveyor to gravity unit, then to finished goods stores.

Fig. 7. Top conveyor connects all operations, from machining and finishing stations to stores. All lines lead into it.

Fig. 8. Receiving and inspection station for parts from tumbling, plating, heat treat. OK parts move to finished stores.



THIS CONCRETE IGNORES SUGARS, SYRUPS

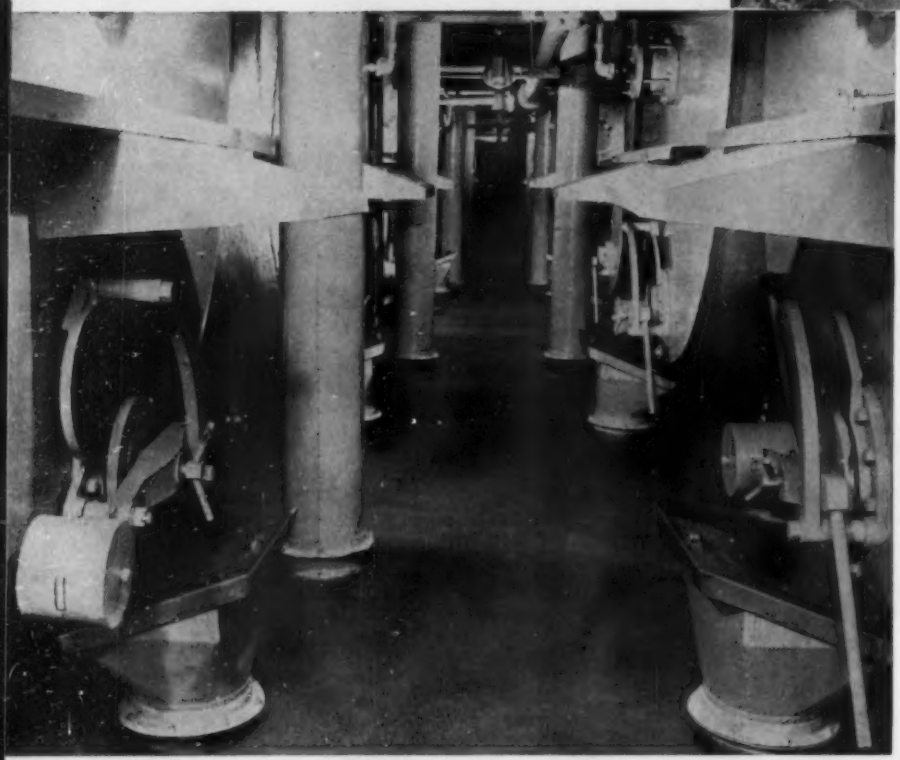


Photo above shows major damage done to concrete flooring, by sugar enzymes in juices from corn pulp, in food processing plant.

Photo at left shows test installation where neoprene cement was laid in corn processing area. After two years, inspection revealed no damage to the flooring.

SUGAR SOLUTIONS—long recognized as relentless enemies of concrete—have been brought under control in the plants of a leading Midwest food processor.

For years, concrete floors in these plants had been eroded and cracked by enzymes and sugar solutions. Pits and cracks developed throughout the buildings, making sanitation difficult, increasing maintenance costs and creating safety hazards.

Company engineers recognized the magnitude of the problem but could find no solution even after tests of a wide variety of flooring materials. Then a flooring contractor recommended a special flooring of neoprene cement that had been developed by Crossfield Products Corp. for outside decks of ocean liners. Because its basic ingredient was neoprene it might be expected to stand up under such conditions.

But the plant engineers, mindful of previous failures, decided to carry out a conclusive test before adopting the material for plant-wide installation. A test installation was made in 1955 in one part of the corn grinding section. The flooring covered was in an advanced state of deterioration.

After two years of service plant engineers inpected the test application and found it perfect in every respect. Contracts were let and renovation started in earnest. First, pools of sugar solution were cleaned off the floor surfaces and the areas were scrubbed with chemical solutions. Loosened concrete was chipped down to a firm surface and cracks and voids were filled with a special underlayment. Following this, a quarter inch of Dex-O-Tex Neotex was applied. **End**

If you want more information on this product simply write "Dex-O-Tex" on one of the postage paid cards elsewhere in this issue and mail it, or write The Editor.

CENTURY-OLD BLEACHERY BECOMES MODERN RESEARCH LAB

THE ELECTRIC Storage Battery Co. of Philadelphia recently consolidated and expanded its research efforts in a modern Research Center at Yardley, Pennsylvania. As the scientists and technicians began to move their apparatus and activities to the new building, it was difficult to believe that four months earlier it had merely served as a storage building. In fact, it had been built a century ago as a bleachery and had seen a succession of uses since.

Drawings were made and construction completed with a speed attributable to a fully co-ordinated building service provided by two Princeton, N.J. firms—Fulmer & Bowers, Architects; and Lewis C. Bowers & Sons, builders.

Within two months after authorization to proceed, plans for the completely modernized building had been finished and approved. Two days later building permits were issued and work was begun. Slightly more than three months after that occupancy began, and within another month the new facilities were in full operation.

Erected just prior to the Civil War, the building was still structurally sound. Its stone walls were 18 in. thick and the pitched roof was supported by steel purlins and rafters. The building was long and narrow, with a total square footage of 29,500. It was 45 ft wide and extended 600 ft back from the street in three separate levels, connected by concrete ramps and stairs.

During initial meetings with Electric Storage Battery Co. officials, the following basic decisions were reached:

. . . The old entrance on the front, narrow end of the building would be eliminated and a new entrance built on the side for direct access from a parking lot, as well as to break up the "too long" look of the building . . .

. . . Administrative offices, library, conference room and reception area were to be located in the west (or street) end of the building . . .

. . . Laboratories and the utilities serving them would be located along the south side of the building, with offices for the research staff along the north side, with a long, three-level corridor separating the offices . . .

. . . An old loading dock would be removed. All stonework would be cleaned and pointed, defective portions replaced, with the stone removed from one area, handled carefully and replaced in others. All new stone had to match the old perfectly to preclude a patchy appearance. Luckily, matching stone was still

View of old building shows inadequate loading platform that was removed. Complete rebuilding and renovation of structure was done in four months.

Night photo of new side entrance shows stonework that was matched perfectly to blend with old stone. Some wall openings were closed and others opened, reusing the old stone if possible.

available at the same quarry that had supplied it for the original building.

After investigating and testing it was found that certain facilities could be used and others augmented. For instance, a well for water supply was found to be more than adequate. Since the lab would have a great deal of water waste, however, a settling tank and two leaching tanks were required, with adequate room provided for expansion to eight tanks when they became necessary.

Lab wastes could be accommodated by an existing septic system, but another had to be designed and installed for sanitary wastes. The building had a 30-kva transformer, but since lighting alone would require that much power, an additional 30-kva unit was added.

Two old boilers were brought up to date and fitted with new burners and controls. It was determined that steam pressure at 8 psi from the reconditioned boilers would be adequate for heating the labs and office areas through 2-in. fin-type radiation. It would not be enough to heat the platens of hydraulic presses, however, and it was decided to provide this by means of small steam generators.

All the laboratories are provided with compressed air—at both high and low pressure—fuel gas, vacuum lines, oxygen and hot and cold water. Both alternating and direct current are provided. Since other gases are needed only occasionally, supplies are provided through portable tanks.

One of the principal factors in the rapid construction program was the simultaneous activity of both the architectural and contracting groups. Even as interior spaces were being designed and laid out on drafting boards, tradesmen began refurbishing the building proper.

In addition to pointing of stone work, the front face was sandblasted to remove old traces of paint. Wooden sash was replaced where necessary and almost 500 sq ft of rotted roof sheathing was removed and replaced. Slag deposits were removed from the roof, and a new guaranteed 15-year built-up roof was installed.

Typical lab area shows marked difference from area shown at right. Research program of company was carefully studied in order to provide all necessary services and utilities for job.

This end of the building was chosen for administrative offices, library, lobby. Front entrance was eliminated and a larger entrance put on the side.

Gravity vents were repaired or removed as needed, and fascias and flashings checked and repaired. Exterior wood batten doors were replaced with hollow metal doors and frames.

Meanwhile other tradesmen cleaned the existing pock-marked floor and laid a new 2-in.-thick floor, reinforced with wire mesh and complete with hard trowel finish. Still others set to work installing a paved drive of bituminous concrete along the north side of the building and a parking area of water-bound macadam.

So, to the Inside

By the time these phases were completed, interior architectural layouts had been approved and equipment and materials ordered, so that work could progress without interruption.

Permanent partitions are of 6-in.-thick, light aggregate block, and other interior spaces are separated by removable partitions. Since the bottom chord of each truss is 11 ft, 9 in. above the finished floor, sixteen courses of block, with ½-in. mortar joints between them, bring the permanent walls up to within 5 in. of the trusses. Final ceiling height was established at 10 ft.

The ceiling is made up of fiber glass sections, 2 ft by 4 ft by ¾ in. These panels are supported by inverted tees, in turn hung by wires from the truss purlins. Four inches of batt type insulation was placed above the ceiling.

Inside faces of all exterior walls were covered with rock lath and plaster. Main office areas have walnut plywood paneling and gold seal asphalt tile. Two walls of the Director's office were covered with a walnut finish paneling, stained and sealed, as were certain sections of the reception area. The lobby has a flagstone floor on a 4-in. concrete base and the west wall of concrete block with deep, indented joints is

painted a soft pastel shade to harmonize with the rest of the interior.

Since certain mechanical installations in the building had not been used for years, the architects were particularly cautious and meticulous in outlining testing procedures.

They specified, for instance, that the water system be thoroughly blown out to remove dirt and grease; then tested to twice its expected hydrostatic working pressure before being concealed.

When drainage connections had been made to all fixtures, a smoke test was specified. This consisted of filling all traps with water, then introducing a thick, penetrating smoke, produced by a smoke machine, into the entire system. As the smoke appeared at roof vent openings, they were sealed tight and a pressure applied equivalent to one inch of water, at which time the system showed no smoke leaks.

Heating specifications required that sections be tested to a hydraulic pressure of 125 psi before being concealed; also that joints be hammered and any leaks made tight. The entire system was then subjected to a pressure of 125 psi and held for eight hours.

Elaborate charts and diagrams, showing essential features of the heating, plumbing and water systems, were provided the owner. These are mounted in glazed frames in boiler rooms and other operating areas to indicate all equipment, valves and controls, with distinguishing numbers.

These numbers correspond to similar numbers on brass tags that are affixed to all valves except those controlling a single fixture.

In order that both management and operating personnel be fully aware of the complex mechanical installations, Fulmer & Bowers provides the owners of all their projects with operating manuals. These contain shop drawings, details and elaborate instructions on the heating system, air conditioning, automatic and manual controls, safety devices, etc.

Detailed Manuals

Management is informed, for instance, what portion of the electrical system is the responsibility of the utility company, when the contractor's guarantees expire, when outside maintenance men must be retained, etc. A more detailed manual is developed for operating and maintenance personnel. It includes maintenance and lubrication data, spare parts lists, valve and system charts, shut-down and starting-up procedures for winter and summer operation, and all pertinent manufacturers' literature.

That these manuals have been helpful and effective has been attested to many times. No chance is taken with late or incomplete information for these manuals. Under "General Conditions" it is specified that the information be submitted in draft form for approval prior to the completion of work. Manufacturers' advertising literature or catalogs may be included for illustrative purposes, but must not, of themselves, constitute the manual.

Further, it must be properly bound and indexed and approved prior to final issue.

In order to provide the researchers with proper environment for both actual experimentation and study, the architects had to acquaint themselves thoroughly with the Electric Storage Battery Company's basic approach to research. As many as 40 or 50 projects are in progress at any one time, balanced between long-range research with payoff in ten years, and short-range inquiry that will hopefully bear fruit in only three years.

Researchers are afforded freedom to satisfy their individual curiosity, and each has ten per cent of his time and budget for investigations of his own choosing. Of the remaining, 40 per cent of the efforts is fundamental in nature and 60 per cent is in applied science. In the latter, they consider and test the feasibility of applying the new fundamental findings to present and potential products of the company. **End**

New reception area. Pastel concrete block walls blend with furnishings. Corridor at left runs entire length of building.

View through open door of director's office shows rich effect of walnut paneling, radiation enclosures and acoustic ceiling.

PLANT SECURITY . . .

This activity affects every department and person in the plant. It calls for well-trained, vigorous, intelligent men. They must cope with disorders, riot, sabotage, detect and prevent pilferage, control outgoing shipments, give first aid, guard payrolls, check visitors' passes and do a dozen other jobs skillfully and tactfully without lost motion

By **FRED E. BRAEMER, Co-Principal, Globe International Detective System, Philadelphia**

NOT TOO MANY years ago, the term "Plant Security" immediately brought to mind a semi-retired, elderly watchman making his nightly clock rounds. There is, however, no more connection between this watchman and the Security Patrolman of today than there is between the Plant Engineer and his counterpart of yesteryear—the plant handy man.

And we feel that this is good. What department is better suited, by virtue of its knowledge, nature of operations, and intimate association with all plant operating departments, to effectively administer the safety, fire prevention, and security programs of its company.

What is the function of Plant Security in today's industry? If you feel it is only to prevent or minimize burglaries, you are still living in the days of the semi-retired watchman and the plant handy man.

Security means that, yes, but it also means the prevention of employee pilferage and theft, the control of outgoing merchandise and vehicles, the effective handling of employee disorders, sabotage, riot and other emergencies, the formulation, and if necessary, the implementation of fire and disaster plans, first aid treatment, visitor control, property pass control, plant safety, investigation of theft, robbery and other security violations, payroll guard, classified document courier, traffic control, fire prevention, accident investigation, classified information control and a host of other duties all involving security, safety and fire prevention.

Obviously, the first requirement for good security is good security personnel . . . the second is good training. With the right program, the right people, and the right training, you will have a security department second to none.

In the selection of security patrolmen, you should choose men with an average I.Q. and at least high school education or equivalent. In addition they should be mature, but not old men. This is necessary so that the older employees will not look on the security patrolmen as "kids." Also, more mature individuals will normally exercise better judgment and act more calmly in emergencies. They are usually more conscientious in their duties, follow orders more exactly, possess more stability and exhibit more job satisfaction than the younger men.

Training and discipline of the guard force should follow as closely as possible the principles and procedures employed by the military. Two of their basic precepts are: 1. new men should receive on-the-job-training supplemented by classroom and individual instruction; 2. no matter how long a man has been on the job, training never ceases. Herein lies one of the basic strengths of the "outside" or "contract" guard service.

About the Author

A Co-Principal of Globe International Detective System, Fred E. Braemer has been associated with this firm since 1939. Previously he had been Director of Training for Bayuk Cigars, Inc. His job, in this position, was to increase the productivity of employees through MTM and concentration on significant features of the individual jobs.

Born in Pittsburgh in 1914, Mr. Braemer attended both the University of Pittsburgh and University of Pennsylvania. He holds memberships in American Institute of Management, American Society for Industrial Security, Pennsylvania Chiefs of Police Association and is a member of the Industrial Policy Committee of this last-named organization.

Planning guard assignments can be accomplished by security officer and captain.

Besides being better able to train security guards—because security is their business—they are able to rotate their personnel into locations with peculiar security problems that present unique opportunities for training. For example, one of Globe's clients manufactures a highly inflammable and explosive product. A guard working in that location for six months will know more about the handling and storage of inflammable material and about fire prevention techniques than the average guard will learn in a lifetime at another location.

Another Globe client manufactures a very small but expensive item that necessitates the use of precious metal on the production line. The techniques employed to insure maximum security and the prevention of employee theft have been rotated through this plant for job training.

Rotation of guards among clients for training highlights another important feature of contract guard service; that is, all guards whether they be employees of the company or employees of a contract guard service will, after a period of time, begin to establish friendships with other employees. Thus the first hole in the dike is established that could eventually grow into a very serious security leak. In the case of contract guards, the solution is simple—transfer to another location. In the case of a company's own guards who have conscientiously done a good job—what do you do?

Too often we find that management, especially in young, fast-growing firms that never had a security program before, either hire a few men to punch a clock during the night, or ask for competitive bids from contract guard agencies. Invariably they award the job to the lowest bidder, and then sit back feeling secure in the knowledge that they now have a "security" program. These people were better off before they went into their security program, for, although they had no security previously—it cost them nothing; now they still have no security but they are paying for it.

This brings to mind the story of a plant guard who, for years, watched a worker take out a wheelbarrow full of sand at least once a week. It looked so suspicious after a while that the guard was sure the fellow was stealing something, so he began going through the sand with a fine tooth comb each time the worker went out and consistently found nothing.

After a few months of this, the guard would only spot check the wheelbarrow in the hopes of hitting the "hot" load by chance. Still he found nothing. One day the worker was laid off and shortly after the guard retired. A few weeks later, the guard met this worker in a bar by chance and said to him, "Joe, I watched you take out a wheelbarrow full of sand for years and I just knew you were stealing something, but I could never catch you. Neither of us work there anymore, so won't you let me in on what you were taking just to satisfy my curiosity. Joe answered, "wheelbarrows."

Buying security is no different than buying material for your production line. You must first establish the standards and quality required, secondly, contact your sources of supply to determine where you can obtain what you want, and lastly, maintain a continuous quality control check to be sure that there is no deviation from what you require and what you ordered. Do not compromise on the quality of your security program. A poor security department will cost you money; a good security department will pay for itself.

In one multi-million dollar warehousing operation that employed its own guards, known inventory shortages were running about $30,000 a year. When Globe talked to one of the company representatives, he was not too badly upset over this fact since their shortages had run about $75,000 a year prior to setting up their own guard force. Our representative pointed out to him, however, that the guard force was costing them $50,000 a year and this figure, coupled with the $30,000 known loss came to $80,000 a year. In other words, it was costing the company $5000 a year more with their guard force than without it.

The company switched over to Globe guards and in the first year, the inventory shortage was reduced to $7500. Cost of the contract service was only $38,500. Thus, the net saving to the company in 1 year was $34,000. Although this is a striking example, it is not unique, for almost every firm which switches from its own guards to contract guards does so because of hard, cold, dollar-and-cents savings.

Do not jump into your security program on a hit or miss basis, not knowing exactly what you are trying to achieve. Divide your over-all security into its three basic components—and then provide for each as completely as possible.

Outside Security—Review the exterior of your facility with an eye toward making it as impenetrable as possible.

Any windows that could be used to gain entrance should be screened or barred. If this is not feasible, they should be wired so as to trigger

an alarm in a central location should they be broken or forced.

Only certain designated and guarded doors should be used for entrance and exit. All others, such as fire exits, should be wired so that they too would sound an alarm should they be opened.

Employee parking should be limited to authorized parking lots or areas, and in certain situations, these areas should be fenced in so that entrances and exit must be made through a guarded gate only.

The perimeter of the plant should be lit up by floodlights at night.

All trucks going in and out should have authorized truck passes and be routed through a check point where the load and/or paperwork can be spot checked.

An employee identification system should be installed and authorization required for all visitors.

Internal Security—If your product lends itself to pilferage, all windows that open should be screened to prevent merchandise from being thrown out to a confederate or thrown out to some secluded area near the building from which it can later be retrieved.

Employee entrance and exit should be through designated guarded doors only.

All employees' personal packages should be checked with a guard upon arrival and picked up again at quitting time.

Receiving and shipping areas should be screened with a locked gate in such a way that drivers would not have access to any merchandise when authorized personnel are not present.

Set up general orders for all your guard personnel and special orders for each guard post.

Be sure the guard is thoroughly acquainted with the entire plant area and completely knows in detail, the area to which he has been assigned.

He should be familiar with the location of buildings, roads, alleys, tanks, water systems, electrical systems, fencing and lighting systems.

He should know every means of exit and the quickest possible way of going from one point to another in the event of an emergency.

He should be able to recognize an emergency when he sees one, and react accordingly.

The following checks should be standard procedure for every patrolling guard:

1. Check night telephone connections. Be certain which phones are connected to the outside operator.

2. Be especially watchful for the presence of smoldering cigarettes that some employee has left at his bench when leaving work.

3. See that no machine or motor has been left running inadvertently.

4. Examine the premises for any unnecessary lights left burning. Also check to see that sufficient lighting is provided so that no vulnerable areas are unlit or in deep shadow. This also applies to the outside perimeter of the plant.

5. Examine the security of all windows and doors. Be satisfied as to the condition of safety exits, fire fighting equipment, etc.

6. Clear all obstructions from aisles and from around fire equipment.

7. Make a thorough check of all hazardous areas such as spraying rooms. Exposed thinners and other inflammables may be present. Waste rags in these areas should be discarded or placed in safe containers at once. Inspect all safety bins that contain combustible materials, see that their lids are securely closed.

8. Inspect locker rooms, toilets, etc., for cigarettes and pipes which may have been left by employees.

9. Check stoves, heaters, and furnaces for overheating. Be sure all inflammable material is at a safe distance.

Do not assume that these checks are necessary only on the first tour. The guard's primary function of the first tour is to catch negligent acts of the hastily departing employee in his rush to punch out and get home.

Each subsequent tour throughout the night is just as important as the first one. Many problems could develop during the night.

In one of Globe's recently acquired locations, the guard was in the process of making his night rounds when he heard voices from behind a closed office door. He immediately called the police and directed them to the area where two men were in the process of opening the safe.

One of the men was a former employee who had obtained a duplicate key to the door. He was quite surprised to find that a Globe guard had been his undoing, since this company did not have any guards when he was fired six weeks ago.

Paperwork Security—All paperwork systems that involve the shipment or transfer of material, or allow authorized removal of mer-

(Continued on page 262)

One important duty of guard force is checking shipments with driver's papers.

time saver series

CONSTRUCTION COST ESTIMATING PART 10

LATHING AND PLASTERING

The following costs are for the most general types of lathing construction and corresponding plaster requirements, as well as for different types of plaster finishes. Plastering and lathing estimates are made in square yards.

Two grades of plastering are recognized: one, ordinary work which permits waves and variations in the finish of 1/8 in. to 3/16 in.; the other, first grade workmanship which permits waves and variations in the finish of 1/32 in. to 1/16 in.

LATHING

1. Suspended metal lath ceiling (30 ft x 30 ft)

Material			
280 ft	1-1/2-in. channel, 4-ft centers	$0.068	$19.04
961 ft	3/4-in. channel, 12-in. centers	.046	44.30
108 sq yd	3.4-lb metal lath	.57	61.56
12 lb	18 ga tie wire	.21	2.52
88 pcs	3/16 in. x 3 ft hangers—264 ft	.016	4.22
Labor			
Lather, 30 hrs at $3.55			106.50
Total cost per 100 sq yd			**$238.14**

2. Suspended gypsum lath ceiling (30 ft x 30 ft)

Material			
364 ft	1-1/2-in. channel, 3-ft centers	.068	24.75
700 ft	3/4-in. channel, 16-in. centers	.046	32.20
105 sq yd	3/8-in. gypsum lath	.36	37.80
231 ft	3/16-in hangers	$0.016	$ 3.70
500 clips		.035	17.50
340 clips		.017	5.78
Labor			
Lather, 20 hrs at $3.55			71.00
Laborer, 4 hrs at $2.76			11.04
Total cost per 100 sq yd			**$203.77**

3. Nailed-on metal lath (100 ft x 9 ft)

Material			
108 sq yd	3.4-lb metal lath	$ .57	$61.56
8 lb	nails	.16	1.28
Labor			
Lather, 9 hrs at $3.55			31.95
Total cost per 100 sq yd			**$94.79**

4. 3/8-in. gypsum lath on wood studs or joists

Material			
108 sq yd	gypsum lath	$ .36	$38.88
8 lb	nails	.15	1.20
Labor			
Lather, 9 hrs at $3.55			31.95
Total cost per 100 sq yd			**$72.03**

5. Metal lath on 2-in. solid partition (112.5 ft x 8 ft)

Material			
112.5 ft	ceiling runner	$0.06	$ 6.75
225 ft	side plate	.12	27.00
688 ft	3/4-in. channel, 16-in. centers—86 studs	.046	31.65
12 lb	18 ga tie wire	.21	2.52
108 sq yd	3.4-lb metal lath	.57	61.56
Stub nails, clips, splice plates			3.75
Labor			
Lather, 18 hrs at $3.55			64.62
Laborer, 2 hrs at $2.76			5.52
Total cost per 100 sq yd			**$203.37**

6. Gypsum lath on 2-in. solid partition (112.5 ft x 8 ft)

Material			
112.5 ft	ceiling runner	$ .06	$ 6.75
225 ft	side plate	.12	27.00
105 sq yd	1/2-in. long lath	.50	52.50
150 ft	3/4-in. channel, temporary bracing	.048/3	2.40
50 ft	strip lath and backing	.02	1.00
100 clips		.007	.70
Labor			
Lather, 22 hrs at $3.55			78.10
Laborer, 4 hrs at $2.76			11.04
Total cost per 100 sq yd			**$179.49**

7. Studless lath on 2-in. solid partition (112.5 ft x 8 ft)

Material			
112.5 ft	ceiling runner	$ .06	$ 6.75
225 ft	side plate	.12	27.00
108 sq yd	3.4-lb 3/8-in. rib lath	.57	61.56
12 lb	18 ga tie wire	.21	2.10
150 ft	1-1/2-in. channel, temporary bracing	.068/3	3.45
nails, splice plates, clips			3.75
Labor			
Lather, 16 hrs at $3.55			56.80
Laborer, 2 hrs at $2.76			5.52
Total cost per 100 sq yd			**$166.93**

8. Double hollow stud metal lath (112.5 x 8 ft)

Material			
225 ft	2 1/2-in. side plate	$ .12	$27.00
224 ft	Z ceiling runner	.06	13.44
1601 ft	3/4-in. channel	.046	73.64
216 sq yd	3.4-lb metal lath	.57	123.12
24 lb	18 ga tie wire	.21	5.04
2 lb	stub nails	.30	.60
Labor			
Lather, 29 hrs at $3.55			102.95
Laborer, 4 hrs at $2.76			11.04
Total cost per 100 sq yd			**$356.83**

1. Plaster on masonry—2 coats

Material		
11 bags gypsum plaster	$1.62	$17.82
33 cu ft sand	.14	4.62
Cost of white plaster finish (time and material)		48.01
Labor		
Plasterer, 10 hrs at $3.55		35.50
Helper, 9 hrs at $2.97		26.73
Total cost per 100 sq yd		**$132.68**

2. Plaster on metal lath—3 coats

Material		
22 bags gypsum plaster	$1.62	$35.64
56 cu ft sand	.14	7.84
Cost of white plaster finish (time and material)		48.01
Labor		
Plasterer, 15 hrs at $3.55		53.25
Helper, 12 hrs at $2.97		35.64
Total cost per 100 sq yd		**$180.38**

3. Plaster on gypsum lath—3 coats

Material		
11 bags gypsum plaster	$1.62	$17.82
28 cu ft sand	.14	3.92
Cost of white plaster finish (time and material)		48.01
Labor		
Plasterer, 14 hrs at $3.55		49.70
Helper, 11 hrs at $2.97		32.67
Total cost per 100 sq yd		**$152.12**

4. Plaster on 2-in. solid partition—metal lath

Material		
46 bags gypsum plaster	$1.62	$74.52
126 cu ft sand	.14	17.64
Cost of white plaster finish (time and material)		96.02
Labor		
Plasterer, 30 hrs at $3.55		106.50
Helper, 24 hrs at $2.97		71.28
Total cost per 100 sq yd		**$365.96**

5. Plaster on 2-in. solid partition—gypsum lath

Material		
32 bags gypsum plaster	$1.62	$51.84
88 cu ft sand	.14	12.32
Cost of white plaster finish (time and material)		96.02
Labor		
Plasterer, 26 hrs at $3.55		92.30
Helper, 20 hrs at $2.97		59.40
Total cost per 100 sq yd		**$311.08**

6. Plaster on concrete—7/16-in. brown coat

Material		
20 bags concrete bond plaster	$1.77	$35.40
Cost of white plaster finish (time and material)		48.01
Labor		
Plasterer, 8 hrs at $3.55		28.40
Helper, 5 hrs at $2.97		14.85
Total cost per 100 sq yd		**$126.66**

Lightweight aggregate plaster weighs less than one half as much as regular sanded plaster. A concrete bond plaster should be used on concrete because ordinary cement plasters have a higher thermal expansion than concrete.

In resilient construction, the wall system floats, to eliminate sound transmission in walls and ceilings. The lath is isolated from the framing members by means of special clips.

Two-inch-thick solid plaster partitions are non-load bearing, save space and costly floor area. Plaster is applied over gypsum lath, metal lath or rib lath.

COST SUMMARY: LATHING AND PLASTERING 100 SQ YD AREA

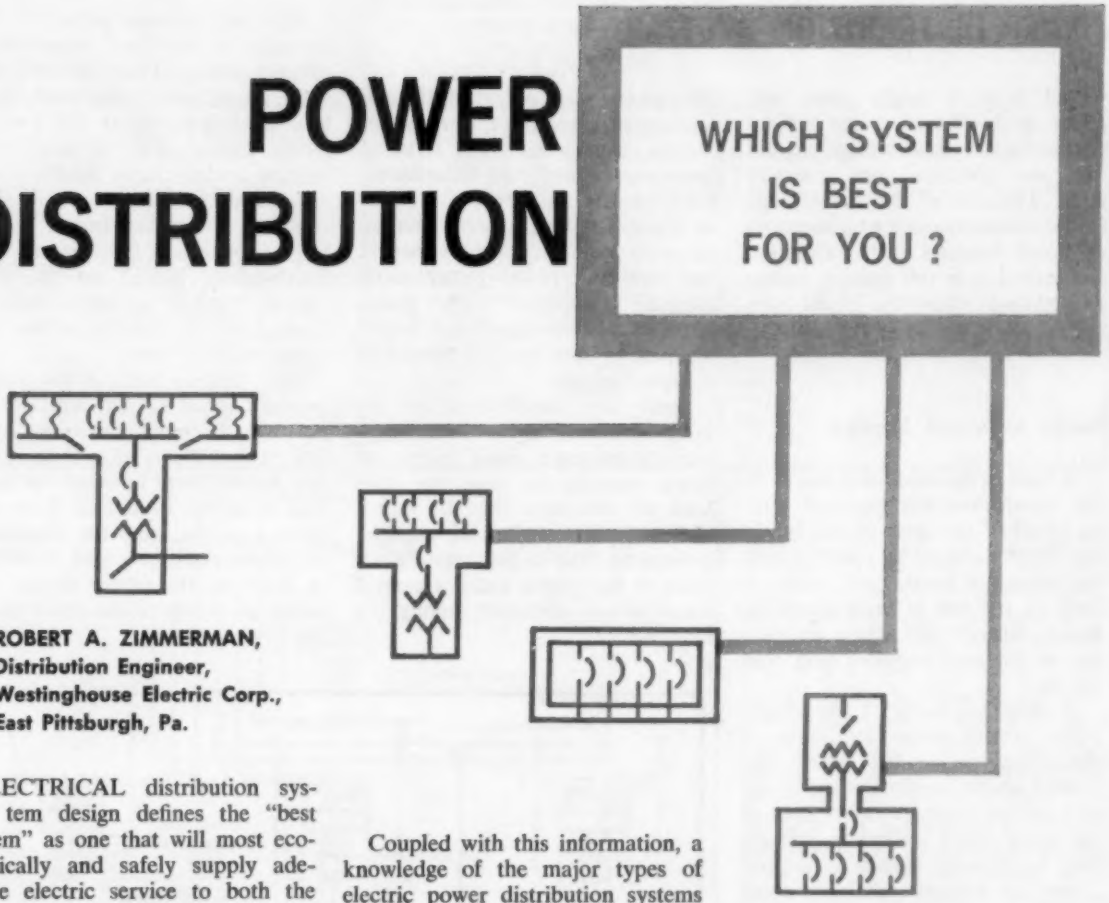
Type of Construction	No. Coats	No. Sides	Lathing	Plastering	Total	Total incl. 26.5% OH and Profit
Suspended metal lath ceiling	3	1	$238.14	$180.38	$418.52	**$529.43**
Suspended gypsum lath ceiling	3	1	203.77	152.12	355.89	**450.20**
Nailed-on metal lath	3	1	94.79	180.38	275.17	**348.09**
Nailed-on gypsum lath	3	1	72.03	152.12	224.15	**283.55**
2-in. solid partition, metal lath	3	2	203.37	365.96	569.33	**720.20**
2-in. solid partition, gypsum lath	3	2	179.49	311.08	490.57	**620.57**
2-in. solid partition, studless	3	2	166.93	365.96	532.89	**674.11**
Double hollow stud, metal lath	3	2	356.83	360.76	717.59	**907.75**

To find the cost of a job, using another type of finish than white, replace the white finish cost ($48.01) in the total cost, with the cost of the finish desired.

Costs in this table are for ordinary work. For first grade workmanship, on 3-coat work, add 5.75 hr to plasterer's time and 2 hr to helper's time, per 100 sq yd of wall area.

Type of Finish	Cost per 100 sq yd
White	**$48.01**
Keene's	**74.97**
Sand float	**43.95**
Acoustical	**129.92**

POWER DISTRIBUTION



By **ROBERT A. ZIMMERMAN,**
Distribution Engineer,
Westinghouse Electric Corp.,
East Pittsburgh, Pa.

ELECTRICAL distribution system design defines the "best system" as one that will most economically and safely supply adequate electric service to both the present and probable future loads. In order to design this optimum system, the design engineer must have information concerning the load and a knowledge of the various types of electrical distribution systems that are applicable.

It is to be expected that the engineer will never have complete load information available when he designs the system. He will have to expand the information made available to him on the basis of experience with similar problems. Of course, it is desirable that he have as much definite information as possible concerning the function, requirements, and characteristics of the utilization devices.

He should know whether certain loads function separately or together as a unit, the magnitude of the demand of the loads viewed separately and as units, the rated voltage and frequency of the devices, their physical location with respect to each other and with respect to the source and the probability and possibility of the relocation of load devices and addition of loads in the future.

Coupled with this information, a knowledge of the major types of electric power distribution systems equips the engineer so that he may arrive at the best system design for the particular building.

Power is usually supplied to small plants at the utilization voltage. In practically all of these cases, the distribution of power within any plant will be achieved through the use of a simple radial distribution system.

Wide Choice of Systems

In those cases where service is available at some voltage higher than the utilization voltage to be used, the system design engineer has a choice of a number of types of systems that he may use. This discussion will cover seven major types of distribution systems and practical modifications of several of them. The seven major types of systems are: simple radial, loop-primary radial, banked-secondary radial, primary-selective radial, secondary-selective radial, simple network, and primary-selective network.

A simple radial system uses a single substation where power is received at the supply voltage and stepped down to the utilization voltage. Power is supplied to the low-voltage bus in the substation through a step-down transformer.

Low-voltage feeder circuits are run from the substation bus to convenient locations throughout the plant from which it is practical and economical to run circuits to the loads. Each low-voltage feeder, Fig. 1, is connected to the substation bus through a circuit breaker. These feeder circuits terminate in switchgear assemblies or panelboards from which power is distributed over smaller load circuits to the utilization devices.

Since the entire load is served through a single substation and from a single low-voltage bus, full advantage can be taken of the diversity among the loads. This means that this system permits the use of minimum transformer capacity to serve a given load.

However, because the loads are

served from a single point and power is distributed at the utilization voltage, system voltage regulation and efficiency are generally poor. The cost of the low-voltage feeder conductors and their associated circuit breakers at the substation are excessive in this system, except in buildings where the feeder runs are relatively short and the peak demand is about 1000 kva or less.

Faults Interrupt Service

A fault in the substation bus or in the transformer will interrupt service to all of the loads in the building. Service cannot be restored until the necessary repairs are made. A fault on any one of the low-voltage feeder circuits will cause an outage to all loads supplied over that feeder.

A modified form of the simple radial system overcomes many of the objections to the system described above by distributing power at a primary voltage rather than at the much lower utilization voltage, Fig. 2. Primary voltage is stepped down by several relatively small transformers at the various load areas within the building. The power center transformer is usually connected to the load bus through a circuit breaker.

Load circuits radiate from the low-voltage bus through circuit breakers the same as they do in the simple radial system. The small secondary substations, or power centers, usually take the form of factory-assembled unit substations. Each consists of a three-phase liquid or air-cooled transformer with an integrally mounted primary switch, and draw-out type low-voltage metal enclosed switchgear. The transformer and switchgear are bolted together to form the unit substation or power center.

Since the transformers are located centrally in the load areas, each transformer must have sufficient capacity to carry the peak load of the area that it serves. Hence, more transformer capacity is required than in the conventional form of the simple radial system if there is any diversity among the load areas.

However, because power is distributed to the load areas at a primary voltage, losses are reduced, voltage regulation is improved, there is a marked saving in the cost of feeder circuits, and the large low-voltage feeder circuit breakers are eliminated. Also, since several small transformers are used instead of one large transformer, the interrupting requirements placed on the load circuit breakers is more uniform throughout the building and is reduced in many cases.

This modern form of the simple primary radial system will usually be lower in initial investment than any other type of distribution system for buildings in which the peak load is above 1000 kva. It is very poor, however, from the standpoint of service continuity and flexibility. A fault on the feeder circuit will cause an outage to the entire building load.

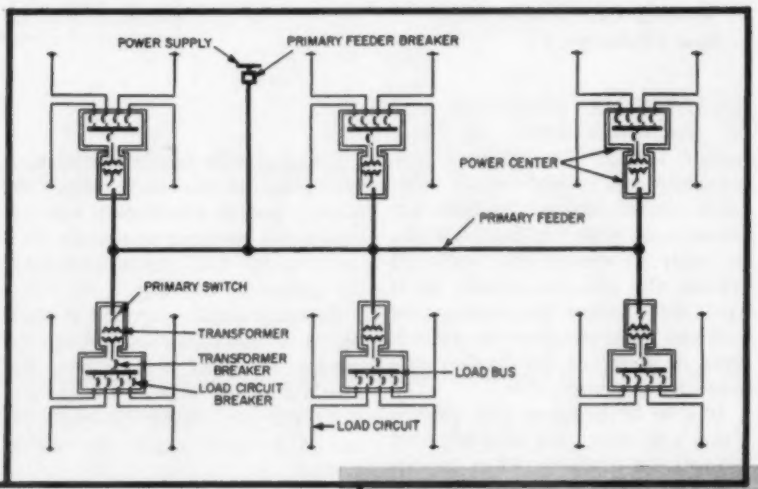


Fig. 2. Primary radial system uses primary feeder to bring high voltage directly to load center unit-substations.

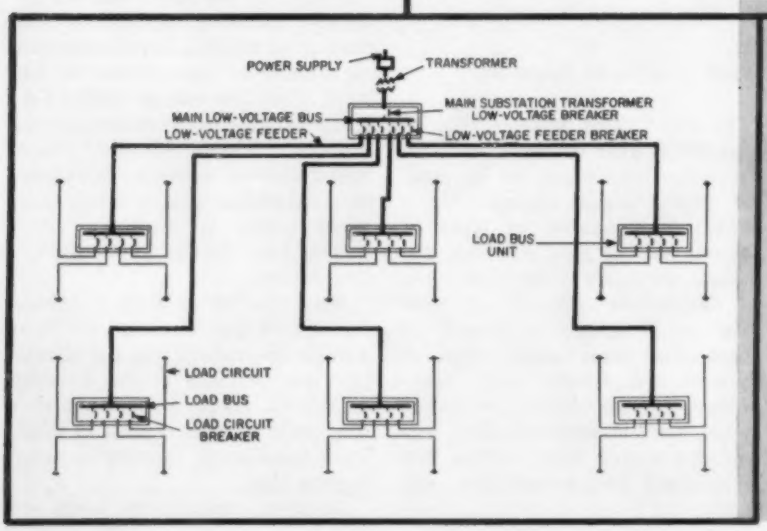


Fig. 1. Simple radial system uses a single substation and power feeders radiate from this point to load centers.

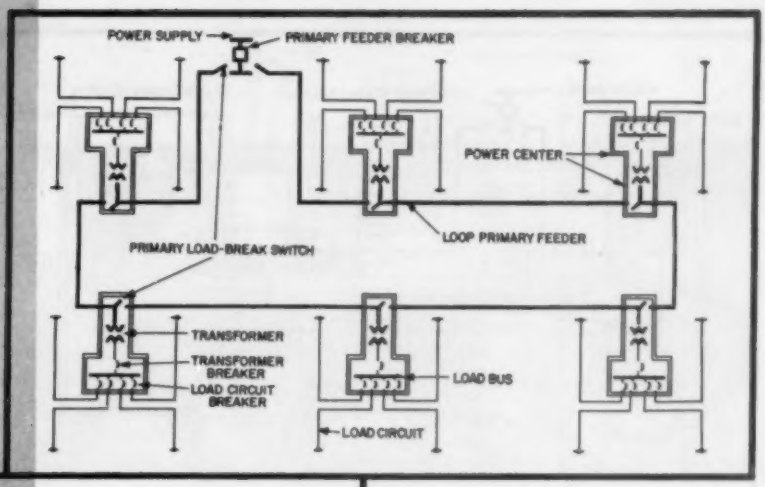
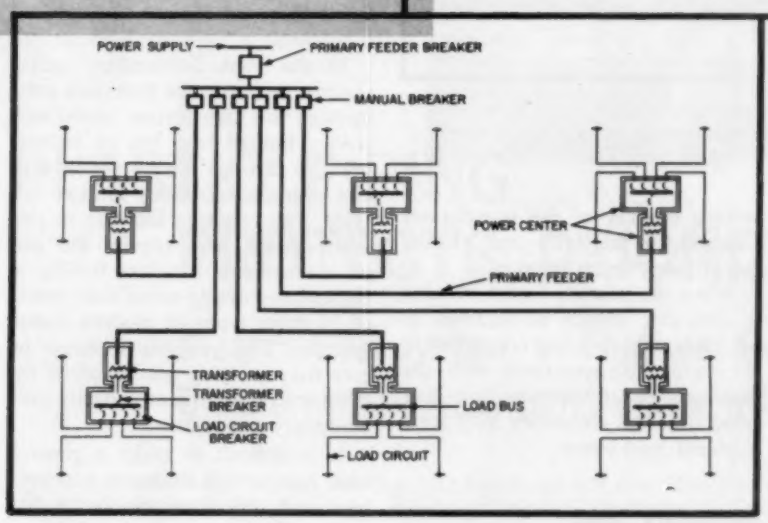


Fig. 4. Loop-primary radial system provides quick restoration of service when feeder or transformer fault occurs.

Fig. 3. Individual primary feeders reduce the load area subject to outages due to failure of any primary feeder.



A fault in one transformer also causes an interruption of service to all loads. Service can be quickly restored to all loads but those served by the faulted transformer by opening the primary switch of the faulted transformer and reclosing the primary feeder breaker.

Separate Primary Feeders

Flexibility and service continuity can be improved upon by reducing the number of transformers connected to a primary feeder circuit. This is accomplished by adding more primary circuits. The increase in the number of feeders and feeder breakers in turn increases the investment in the system. However, a greater number of primary feeders reduces the extent of an outage resulting from a feeder or transformer fault.

If the number of primary feeders is increased so that there is only one transformer connected to each feeder, Fig. 3, the system is comparable in service continuity to the single substation form of the simple radial system that uses low-voltage feeders.

Such a system arrangement, using a separate feeder and automatic feeder circuit breaker with each transformer, will usually be very expensive. The cost can be materially reduced, however, by replacing the automatic feeder breakers with manually operated breakers or load-break switches and backing up a number of these switches with one automatic circuit breaker.

In this form of the simple radial system, a primary feeder or transformer fault causes an outage to all loads. Service can be quickly restored to all loads except those normally supplied from the faulty cable or transformer by opening the load-break switch associated with the fault and closing the circuit breaker. Service cannot be restored to the area associated with the faulty portion of the system until the necessary repairs are made.

The loop-primary radial system, Fig. 4, is similar in principal to the simple radial system. It provides quick restoration of service when a primary feeder or transformer fault occurs, as does the modified simple radial system and, at a lower investment. A sectionalized primary loop controlled by a single primary feeder breaker, is used rather than a radial primary feeder.

Manually operated load-break switches are installed in the feeder for sectionalizing purposes. Two are located where the feeder branches to form the loop, and the others are located at the transformers. This makes it possible to disconnect any transformer and its associated section of loop from the rest of the system.

Primary Loop System

When a transformer or primary feeder fault occurs, the main feeder breaker opens and interrupts service to all loads. Increasing the number of primary loop feeders will reduce the extent of the outage from a fault, but will also increase the system investment. The faulty section of loop and its associated transformer can be disconnected from the system by the load-break switches.

Service can then be restored to all but the disconnected portion of the system by closing the primary feeder breaker. Service cannot, how-

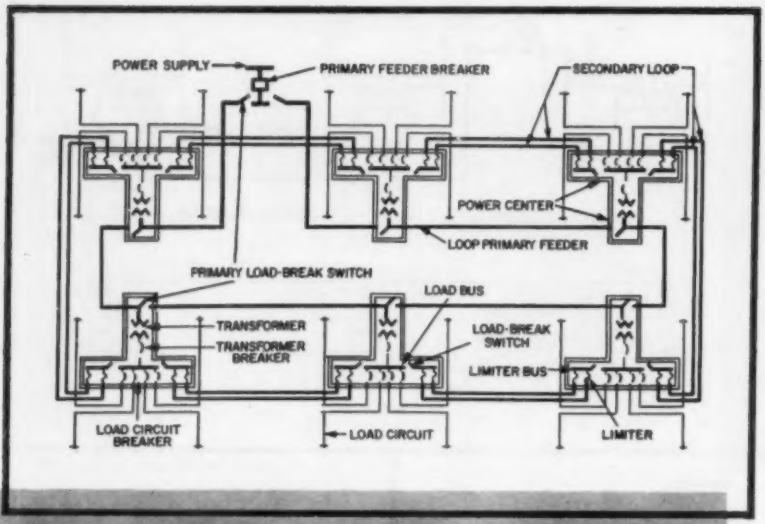


Fig. 5. Banked-secondary radial system is designed for quick restoration of service to all loads following a primary feeder or transformer winding fault.

ever, be restored to the loads in the area where the transformer or primary loop section is in trouble until the necessary repairs are made.

Cost of this system is only slightly more than that of the modern simple radial system. The primary cable cost is a little greater and there are two additional load-break switches in the system. The load-break switches associated with the transformers will cost little more than the disconnecting switches in the primary leads of the transformers of the simple radial system.

A banked-secondary radial system, Fig. 5, permits quick restoration of service to all loads following a primary feeder or transformer fault. It uses a secondary loop to provide an emergency supply when a fault occurs in a transformer or a section of the primary loop. The primary circuit arrangement is the same as that in the loop-primary radial system of Fig. 4.

Restoring Service

The primary feeder arrangement of the simple radial system of Fig. 3 can be used to give the same results, but it usually will be more costly.

A primary feeder or transformer fault causes the main breaker to operate and drop all load. Service can be restored by opening the two load-break switches and the low-voltage breaker of the transformer adjacent to the fault and closing the primary feeder breaker.

When the primary feeder breaker is reclosed, service is restored to all loads. Those loads connected to the load bus associated with the disconnected transformer are supplied over the secondary loop form adjacent load buses.

Secondary Loop

The secondary loop gives a number of important advantages other than providing an emergency supply to restore service. It helps equalize the loads on all transformers and thus makes it unnecessary to match the transformer capacity at each load center to the load connected to each load bus.

Balancing transformer capacity and load in each load area may be a real problem on all other types of radial systems except the radial system of Fig. 1. The secondary loop permits a single kva rating of transformer to be used throughout the system and load circuits can be run directly from the nearest bus to the leads.

Advantage is taken of the diversity among the loads because all transformers are connected in parallel. As a result, there usually is a saving in transformer capacity over that required in any other form of radial system except the simple radial system of Fig. 1. Also, this system is better adapted for across-the-line starting of relatively large motors than is any other type of radial system because the starting current is supplied through several transformers in parallel rather than through a single transformer.

Thus, if the starting of large motors is involved, the use of this system may result in a saving in the cost of motor starting equipment. Likewise, it is the most satisfactory type of radial system for combined light and power secondary circuits.

Fault Current Flow

In the banked-secondary radial system, fault current flows not only through the transformer associated with a faulted load bus or circuit, but also through other transformers and over the secondary loop to the fault. The resulting increase in the fault current may require the use of load circuit breakers having a higher interrupting rating than needed in other types of modern radial systems. This possible increase in cost may or may not be offset by savings in transformer capacity and secondary conductors.

It is difficult to make a general cost comparison between this system and the loop-primary radial system. In some plants the additional cost of the secondary loop will be offset by the saving in transformer capacity and secondary conductors.

In other plants, because of lack of diversity and a relatively uniform distribution of load, these savings are very small and the system will cost more than the loop-primary radial system by about the cost of the secondary loop. However, the advantages of quick restoration of service to all loads, greater flexibility, higher efficiency, and better voltage conditions, may justify the extra cost. **End of Part I**

Watch For Part II

Part II will discuss additional electrical distribution circuits and cover their advantages, disadvantages and relative costs. Circuits will include the primary-selective radial, secondary-selective radial, and alternating current secondary network systems.

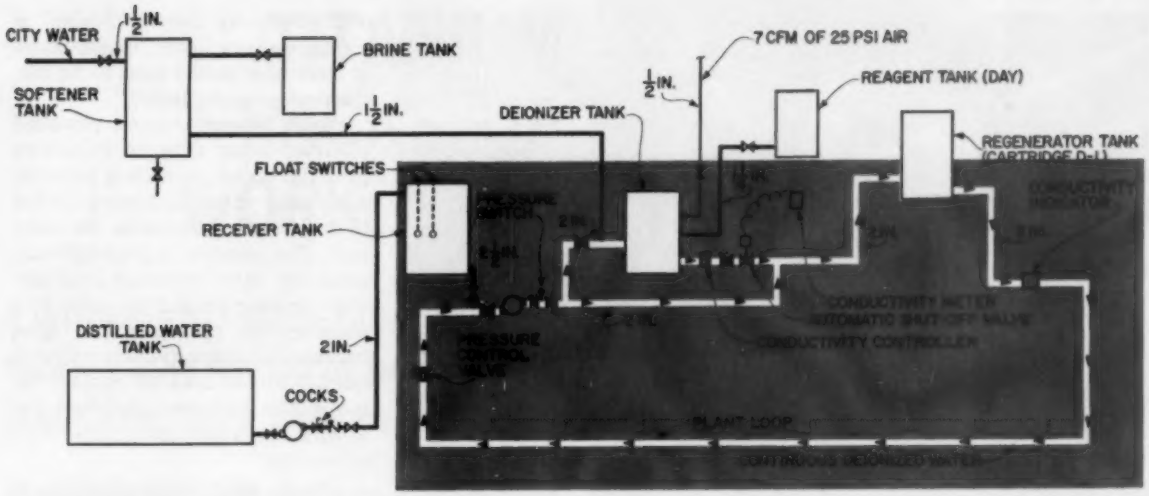


Fig. 1 Flow diagram of deionized water distribution system at Hughes shows equipment that controls water purity.

PLASTIC PIPING PROTECTS DEIONIZED WATER

Distribution system at Hughes' Semiconductor Division plant maintains water at 11 megohm purity

AN ALL-PLASTIC PIPE and all-plastic valve cold deionized water distribution system, for supplying highly purified and deionized cold water where it is needed along the production line, is in use in the new plant of the Semiconductor Division of Hughes Aircraft Company at Newport Beach, California. According to W. H. Hughes, Assistant Plant Engineer, cost of the all-plastic piping and valves was approximately 50 per cent of the cost of piping and valves conventionally used for similar systems.

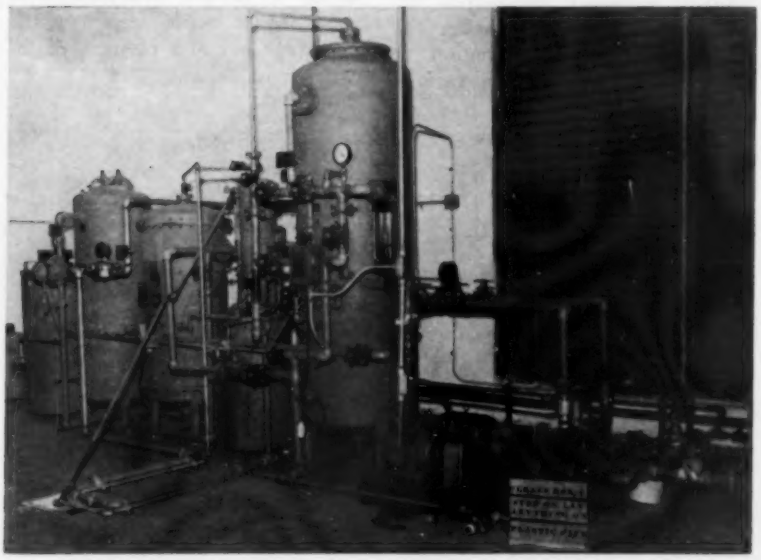


Fig. 2. Eleven megohm water is made by this deionizer from 4 megohm water.

"The production of semiconductors generates some critical problems," Hughes points out. "One of these is the need for 11 megohm water (water purified and deionized until it exhibits 11 million ohms resistance per cubic centimeter) at various points along the production line. Water of such purity must be delivered to the points of use through a completely inert distribution system. Before the new plant was built, we had used stainless steel piping and valves for this purpose. We still use stainless steel in systems where temperatures may exceed 150 F. But for cold water distribution, the plastic piping has worked out very well."

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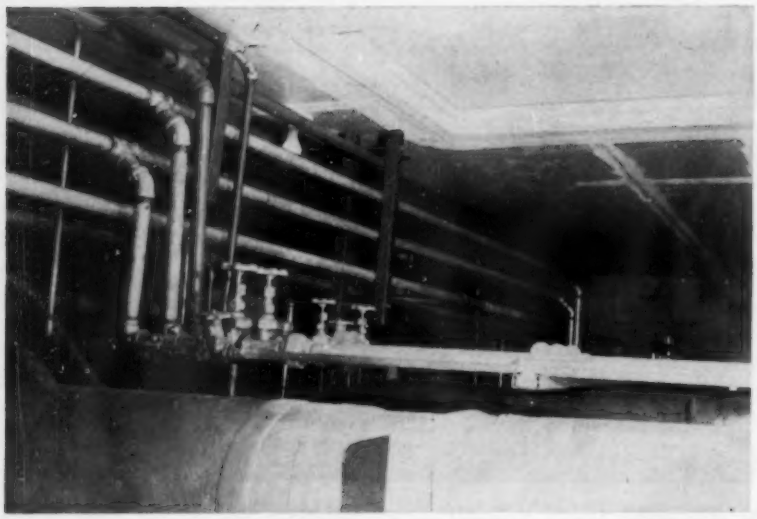


Fig. 3. Heavier plastic piping, shown here, was installed with threaded fittings.

Basically, the Hughes deionized water distribution systems consist of a large storage tank into which purchased water of from 2 to 4 megohm purity is delivered by tank truck. It is pumped from this storage tank through a deionizer which produces the necessary 11 megohm purity, then circulated at 60 psi through the plastic distribution system.

Storage tank, pump, deionizer and plastic piping are connected in a continuous loop, and circulation is constantly maintained to prevent accumulation of sediments and possible deterioration of purity caused by water stagnation anywhere in the system. The deionizer is equipped with a bridge circuit which constantly measures water resistance, and if at any time the purity falls below the 11 megohm requisite, the entire system automatically shuts off.

The distribution system itself contains approximately 3000 ft of ¾ in., 1 in., and 1½ in. PVC (polyvinyl chloride) plastic piping, and 200 plastic shutoff valves. The pipe was purchased in 20 ft lengths, and cut with an ordinary steel pipe cutter when necessary. The thin-walled pipes (corresponding to Schedule 40 in steel pipes) were connected by means of plastic fittings. Joints were sealed with PVC cement which solidifies to a hard rubber consistency.

Wall thinness on these pipes precluded the use of threaded fittings. Heavier plastic piping (corresponding to Schedule 80 and above in steel piping) was installed with threaded fittings, and threads were cut using a conventional steel die pipe thread cutter.

Though the manufacturer's recommendations state that the PVC pipe can be bent, if heated, to a radius equal to 10 times the pipe diameter, no bending was attempted in the Hughes installation. Instead, angled fittings were used when it was necessary to change the running direction.

"Remember, however, that plastic pipe lengths are inherently very flexible, and long bends which do not exceed the elastic limits of the material can be accomplished during the normal course of installation," Hughes points out. "This actually simplified installation to some extent. Where the piping will be concealed after installation, it can be woven in and around various obstructions by merely "flexing" it within its elastic limits. Similar bends in steel pipe would have to be mechanically accomplished."

Plastic shutoff valves, installed wherever water must be withdrawn from the system, contain a ball-type valve plug seated against a Teflon O-ring which surrounds the inlet port. This provides a dead-tight seal when the valve is closed, and prevents leakage around the valve plug when in the open position. Also, because the major friction source is limited to the area of contact between the ball-type plug and the O-ring, the valve is normally easy to operate.

Due to the inherent flexibility of the plastic pipes, more pipe hangers are required than for steel pipe. In the Hughes installation, these hangers are spaced at 5 ft maximum intervals. Ordinary ring-type pipe hangers—the same as for steel pipe —were used.

When questioned regarding the life expectancy of the plastic pipe installation, Hughes had this to say: —"While the plastic pipe is probably more susceptible to external injury than stainless steel pipe, most of our installation is concealed behind wall or ceiling panels, and is well protected from this particular danger.

Also, in the event of an unusual pressure surge, it is possible that the plastic pipe might rupture more easily than steel pipe. But under normal operating conditions, and insofar as normal deterioration is concerned, it would seem that the life expectancy of a plastic pipe installation is unlimited." **End**

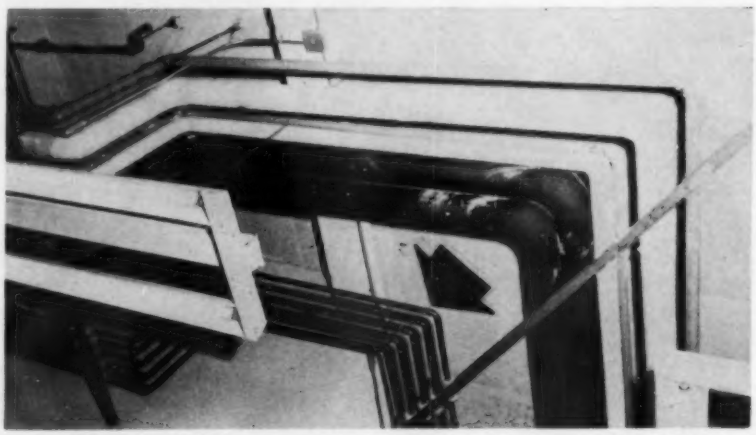


Fig. 4. Thin-wall piping was connected with slip-on fittings and plastic cement.

TITANIUM RACKS UP WORK LOAD

Lightweight, shop-fabricated work racks improve parts handling and processing

Fig. 1. Operator opens work-holding finger on titanium rack. Titanium fingers retain temper, need not be straightened.

Fig. 2, left. Tool is required to pull back finger on this metal rack which must be stripped after anodizing cycle.

By D. J. CARR, Mechanical Design Engineer, Long Beach Div. Douglas Aircraft Co.

TITANIUM WORK-HOLDING finger racks for anodic processing are now in production use at the Long Beach, California Division of Douglas Aircraft Co.

These finger racks have several advantages over the metal racks formerly employed. Total cost, including material and fabrication costs, is only slightly higher than for the old racks; they weigh less and are easier to load as no tool is required to spring back the rack finger which receives and clamps the work during processing.

Most important, the anodic film applied to the work in a titanium rack is consistently good. This is because titanium does not acquire the anodic coating and electrical contact and process efficiency remains constant throughout the anodic cycle. During anodizing, the old type racks gradually acquired an anodic coating along with the part being processed. This film acts as a dielectric, affecting the electrical contact between both the solution and the work rack, and the rack and the parts. Thus anodizing becomes less efficient as the process progresses.

A final advantage is that, because the titanium racks do not acquire an anodic film, it is not necessary to strip them between each cycle of operation.

The decision to change to titanium work racks was made only after comprehensive study by the Douglas Plant Engineering department and associated research and production divisions. Experiments were made with several materials, but the final choice was in favor of titanium.

Initial tests showed that commercially pure titanium and all its alloys were equally resistant to the solutions used in the anodic process. Thus scrap titanium could be employed in rack fabrication. Additional tests indicated that they would be easier to fabricate and use than the old type racks and that only about one-fourth as much material (by weight) would be required in a rack designed to utilize the full strength of titanium. Because of the lighter material, fabrication would be simplified and because of easier loading, direct labor costs would be lessened. It was thus indicated that the over-all long term cost of using titanium racks would be less than that for other types. There would also be the bonus of better anodic film quality.

With these facts at hand, the Plant Engineering department designed a work-holding finger rack. Cold forming and spot welding are used in fabrication. The dimensions are not critical and could be varied to suit different part or workpiece shapes.

The racks formerly used lasted from three to four months, largely because of deterioration in the pre-anodic etching solution and in the solution used to strip them of their anodic film. Life expectancy of the titanium racks is from three to five years. Total cost of an old rack was approximately $52; estimated cost of a titanium rack is about $65, including material and labor.

The change to titanium racks —500 of them—is being accomplished gradually. **End**

WHAT IS YOUR MF IN LIGHTING?

By GEORGE J. TAYLOR
and R. D. BRADLEY,
Day-Brite Lighting Inc.,
St. Louis, Missouri

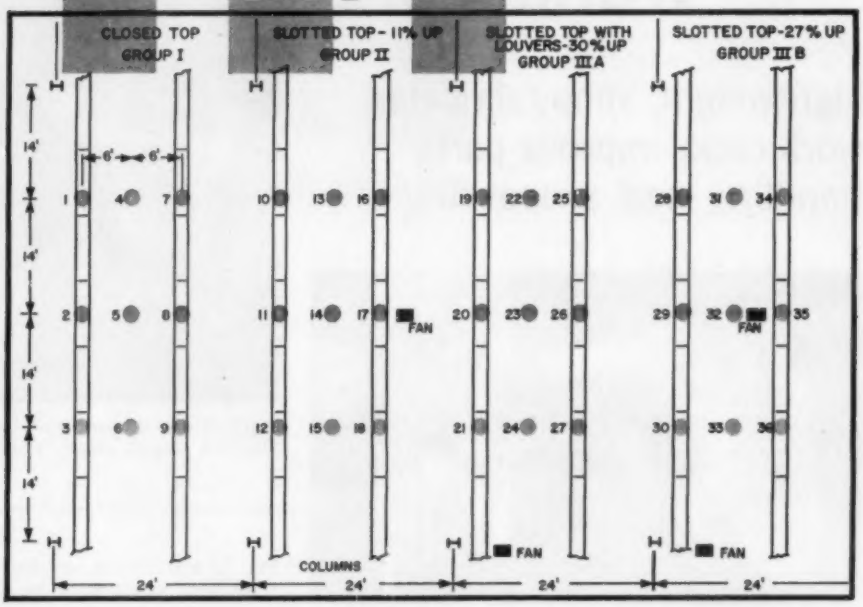


Fig. 1. Test area uses four different types of luminaires. Colored circles indicate test stations. Readings were averaged to plot depreciation curves.

ONE BIG UNKNOWN in any lighting calculation or lighting maintenance problem is the "maintenance factor," usually abreviated MF. This factor is the allowance which must always be made to take into account the depreciation of lamps and light control elements below their initial or design values so that the desired footcandle levels may be maintained in service.

All other factors, normally used in lighting calculations, can be determined with a relatively high degree of precision but the application of maintenance factors has been largely guesswork. To provide additional information on this important part of lighting design, we have made a three year study of conditions found in an actual operating plant using modern types of industrial lighting equipment.

Centrally located in a section of a large newly constructed manufacturing plant, the test area covers a space 56 ft by 96 ft or over 5000 sq ft. Work performed in the test area is light manufacturing consisting of assembly and wiring of luminaires. Atmospheric conditions can be described as generally clean, with dry dust particles floating in the air.

Located 16 ft above the floor, the ceiling in the test area is composed of large panels of Fiberglas sprayed with white paint. The building frame is composed of steel upright columns spaced on 24-ft by 56-ft centers also painted white. The floor is smooth concrete with a light gray color.

Luminaires in this area, Fig. 1., are arranged so that there are two continuous rows in each bay. There are seven luminaires per row or a total of 14 for each test group. Reflectors are porcelain enameled and each fixture is equipped with two 96-in. standard cool white slimline, 430 ma lamps.

Three types of fixtures are used and are arranged in groups. Group I fixtures use a solid top reflector with all light directed downward. Group II units have slotted top reflectors with about 11 per cent uplight and the remaining light directed downward.

Group III units cover the large uplight designs and are broken down into two classes. Group III-A has slotted reflectors providing about 30 per cent uplight and in addition uses bottom louvers on the reflectors. Group III-B has open bottom and open end reflectors with slots providing about 27 per cent uplight.

Test Procedure

All luminaires are mounted 14 ft above the floor measured to the bottom edge of the reflectors. The predominant working plane was established at 40 in. above the floor since most of the visual tasks were performed at this level. A stand was made to hold the test meter at this distance above the floor to assure accuracy in the test readings.

There are nine test stations located under each Group of luminaires. The nine readings were averaged for use in preparation of the graphs. Significant data accumulated over approximately 2½ years is

plotted in graph form in Fig. 2. The upper set of curves are plotted directly from the average readings mentioned above. The lamp depreciation curve is taken from recent information provided by lamp manufacturers.

Upper set of curves in Fig. 2 represents the rate of depreciation of dust and dirt accumulation on lamps and reflectors and the normal depreciation of the lamps. The lower set of curves shows the rate of depreciation due only to the dust and dirt accumulation on lamps and reflectors.

Results plotted in Fig. 2 disclose information of value in the study of maintenance of industrial luminaires. To cite one specific example, the dust and dirt accumulation is tabulated in Table I, using Group I as units with maximum rate of depreciation in comparison with other types of units tested after approximately 30 months' service.

There is another factor that generally contributes to the loss or depreciation of light, referred to as lamp mortality. In large lighting installations it is not always convenient or economical to spot-replace lamps as they burn out. However, it would be to the detriment of working conditions to allow burnouts to exceed but a few per cent of the total lamps in service. A third factor accounting for loss of light is lamp depreciation, which like dust and dirt is common to all types of industrial luminaires.

Curves in Fig. 3 show, in combination, the three major contributing factors in depreciation or loss of light output.

These are loss due to lamp depreciation and mortality, loss due to lamp mortality only and total loss including dust and dirt.

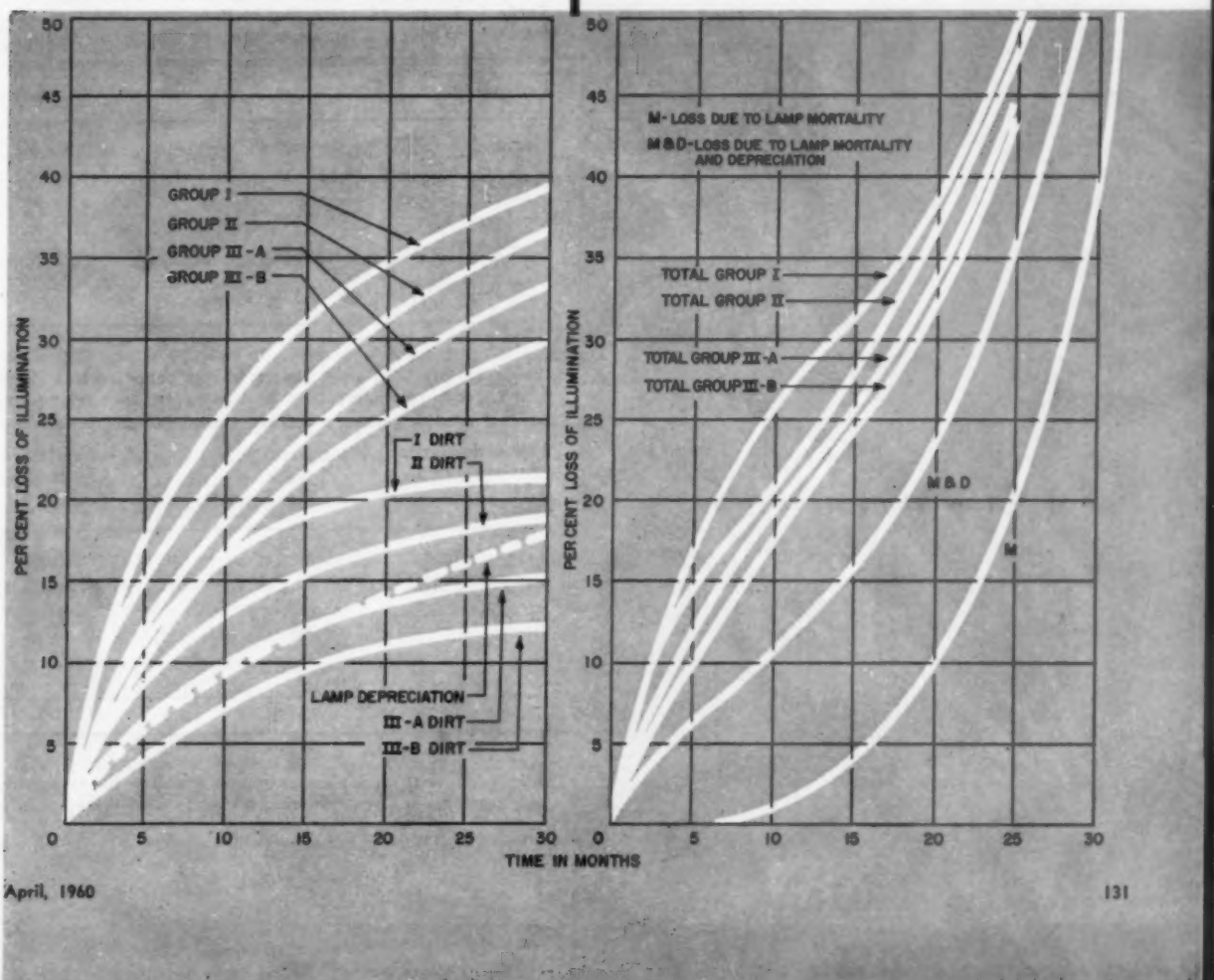
The lamp mortality curve, is adjusted to actual operating performance as experienced during the test period. This is, therefore, based on an average lamp life of 11,000 hours. The "variable" depreciation curves due to dust and dirt accumulation, Fig. 2 when added to the plotted results of the lamp depreciation and mortality curve produce the four "total depreciation" or loss of light curves shown in Fig. 3.

It is obvious that if no maintenance attention is given to a lighting installation a depreciation in excess of 50 per cent is possible. Yet, it is inconceivable that lamps would not be replaced shortly after they burn out unless a strict group relamping schedule is followed, where a few per cent of lamp outages are allowed prior to complete relamping. If lamps are replaced as they burn out, the depreciation due to mortality can be overlooked.

Perhaps it should be explained that with an installation of new lamps it can be expected that about 50 per cent of the lamps will burn out at 100 per cent of rated life. In the tests reported here only a few lamps burned out between 10 to 15

Fig. 2. Lower curves show light loss due to dirt on lamps and reflectors. Upper curves include lamp depreciation.

Fig. 3. Total loss of light due to dust and dirt accumulation, normal lamp depreciation and plotted lamp mortality.



WHAT IS YOUR LIGHTING MF?

months and about half of them burned out after slightly more than 30 months.

When new lamps replaced burned out lamps, the rate of burnout of these lamps will be similar to the mortality curve shown in Fig 3. If the curves of these renewed lamps were added, at the proper intervals, after the time when lamps are renewed, to the burnout curve of the original installation, a composite curve would result.

After the second to third rated life period the replacement of lamps would level off to the extent where approximately the same number of lamps would be replaced monthly. In the installation tested this period would not be reached until after the sixth or seventh year.

When burned-out lamps are replaced there is no loss of light due to mortality. When the leveling off period is reached, there will not only be no loss of light due to lamp mortality but with new lamps mixed with old lamps, the lamp depreciation will be maintained at some higher average rate than for old lamps only.

Comparison of the merits of individual or spot replacement compared to group relamping has been discussed by many at great length. We favor the group relamping maintenance schedule since it is the most economical procedure to follow when considering the importance of cost of light delivered at the point of seeing.

The I.E.S. Committee on Recommendations for Quality and Quantity of Illumination has recommended that levels of illumination be established for specific seeing tasks and that these levels be considered as a "minimum on the task at any time". Therefore, the maintenance factor no longer is to be considered in providing average footcandles for seeing tasks. Instead, it must provide for a value that will not go below the level of illumination prescribed at any time for the seeing task.

This means that when the footcandle level falls to a predetermined level, something must be done. The assignment of a maintenance factor (MF) must be carefully considered. Moreover, the atmospheric conditions of a room will have a direct bearing on the MF selected. So it is that the accumulation of dust and dirt becomes the truly variable factor in maintenance.

One approach in determining the MF for a lighting system would be to construct a set of curves as shown in Fig. 4. The example relates to Group II type luminaires. Assume that MF=0.75. Then when the total depreciation curve crosses the line at 25 per cent loss in illumination, something must be done. If the luminaires are washed at this time, 13 months, 11.5 per cent of the light is regained. Another 2.5 per cent is realized by replacing burned out lamps. This establishes the lamp depreciation curve as a new base point at 13 months.

From this point are drawn new

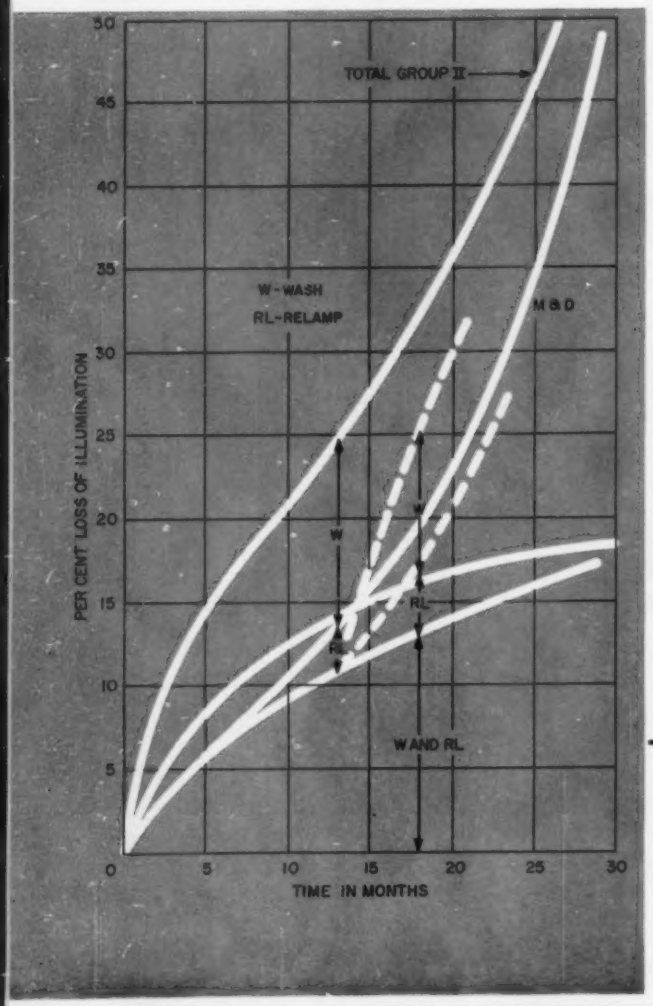


Table I. Relative depreciation in light output of four systems due to dust and dirt expressed as a per cent of Group I.

Luminaires		Per cent of Group I
Group I	(Solid top reflector)	100
Group II	(11 per cent uplight)	87.5
Group III		
A—	(Louvered—30 per cent uplight	71.5
B—	(27 per cent uplight)	56.0

Table II. Methods used change maintenance factors. System 1, group relamping only, system 2, plus spot relamping.

Luminaire Group	System 1 from Fig. 5	System 2 from Fig. 4
I	0.61	0.66
II	0.64	0.69
III-A	0.67	0.72
III-B	0.69	0.75

Fig. 4. How to plot a maintenance schedule for relamping and washing fixtures assuming a maintenance factor of 0.75.

Table III. Comparison of four industrial lighting systems based on test data.

Room Size: 100' x 100' Mounting Height: 14' Room Index: A Room Finish: 75/50/15 Lamps: Cool White Slimline	Luminaires equipped with all-white all-porcelain reflectors.		Watts: 174 per luminaire Power: 1½ ¢/KWH Average Annual Costs Based on 100 Footcandles Minimum.	
	GROUP I Solid Top	GROUP II 11% Uplight	GROUP IIIA 30% Uplight Louvered	GROUP IIIB 27% Uplight
Maintenance Factor (MF)	.66	.69	.72	.75
Coefficient of Utilization	.72	.74	.64	.71
Footcandles (Initial)	152	145	139	133
Number of Luminaires	210	196	217	188
Total Number Lamps	420	392	434	376
Number Lamps Replaced (10% at 20 months)	42	39	43	38
Aver. Annual Cost Lamps (Group relamp at 20 mos.)	$ 640.00	$ 597.00	$ 662.00	$ 573.00
Aver. Ann. Group Relamp. (Labor at 10¢/lamp)	$ 25.20	$ 23.50	$ 26.00	$ 22.55
Aver. Ann. Spot Relamp. (Labor at 50¢/lamp)	$ 12.60	$ 11.70	$ 12.90	$ 11.40
Tot. Aver. Ann. Relamp Cost (Group and Spot Replacement)	$ 37.80	$ 35.20	$ 38.90	$ 33.95
Tot. Aver. Lamp Cost (Lamps and Labor)	$ 677.80	$ 632.20	$ 700.90	$ 606.95
Cleaning Cost/Luminaire	$ .60	$ .60	$ 1.00	$ 0.80
Annual Amortization (10% of Original Cost)	$1140.00	$1060.00	$1465.00	$1080.00
Annual Power Cost (1½¢/KWH)	$2190.00	$2050.00	$2270.00	$1960.00
Tot. Aver. Ann. Oper. Cost	$4083.00	$3813.00	$4566.00	$3737.00
% of Group I	100	93	112	91
Total First Cost (Includes Lamps)	$12,400.00	$11,600.00	$15,700.00	$11,700.00
% of Group I	100	94	127	95
Glare Factor—Crosswise	(G) 230	(G) 190	(C) 27	(C) 30
Glare Factor—Lengthwise	(G) 200	(G) 160	(C) 33	(E) 80

total depreciation and lamp mortality and dust and dirt curves (dotted lines). The total depreciation curve crosses the 25 per cent loss in illumination line at about 18 months. Washing luminaires picks up about eight per cent and relamping of burned lamps about four per cent.

To repeat the above related procedure again would prove impractical and uneconomical. This is due to the fact that at 18 months lamp depreciation has reached a value of about 13.5 per cent. Also, the original lamps are beginning to burn out at a rapid rate. So little would be gained in increasing light output for the time and money spent when the 75 per cent line is reached the third time. Consequently, it is recommended that luminaires be washed and all lamps replaced at 18 month intervals. When this is done, the illumination level is restored to its original value and the cycle of events repeated.

Perhaps a more practical and simple approach would be to assign maintenance factors for each room condition. For instance, the test results shown in Fig. 2 may be considered as taken in a room with fairly clean conditions. The next thing would be to determine the hours the lighting system will be operated per year from which a mortality curve can be drawn, as in Fig. 3.

Now if we consider group relamping as the most economical maintenance program to follow there are two methods that can be used.

In system 1 we group relamp when 10 per cent of lamps burn out and in system 2 we do the same but also spot relamp the 10 per cent burnouts.

From this analysis, maintenance factors can be assigned for various types of luminaires for specific room conditions. Taking the conditions from the tests conducted, with 10 per cent of the lamps burned out at 20 months, we will have maintenance factors as shown in Table II.

These maintenance factors would be used in computing illumination levels using the lumen method. If lamps are permitted to burn out without spot replacement, the light output suffers approximately in proportion to the burnouts. To compensate for this, the MF would be as shown in the tabulation for the maintenance program of System 1.

This would require about 10 per cent more luminaires to achieve the minimum footcandles required for a given visual task, so it appears wise to follow System 2 using the figures shown for MF. This would mean that at the end of 20 months each of the "groups" of luminaires would have depreciated to a predetermined value of say, 100 ft-c, at which time it is recommended that all lamps be replaced and luminaires washed. Some proponents of group relamping programs suggest that the spot replacement lamps be marked and used again for replacement purposes after the first group relamping.

Establishment of MF becomes an economic factor depending upon conditions within a given room or plant area. In the particular area where tests were conducted, the essential factors of general interest are tabulated in Table III. The assignment of MF takes into account that at the end of 20 months 100 ft-c will be obtained after which group relamping will take place and luminaires washed to restore the illumination level to its original value.

Results shown in Table III in regard to costs do not presume the necessity of washing luminaires except at the end of the 20 months' operation. Another approach would be to assign some value such as MF=0.75 to all "groups" of luminaires as previously discussed. If this were done, a planned maintenance schedule would have to be determined for each lighting system depending upon the type of luminaires used.

Obviously, when MF values increase, the number of luminaires required for the job decreases. On the other hand, if high MF values are assigned without care, then it is quite possible that more frequent washing will be necessary. **End**

MOBILE SPRAY BOOTHS FOLLOW THE WHIRLYBIRDS

By G. K. STEPHENSON, Chief Plant Engineer, Bell Helicopter Corp., Hurst, Texas

TO HELP MEET production schedules requiring the painting of more than one helicopter at a time, Bell Helicopter Corporation installed two large traveling paint booths in its new paint building addition.

Painting of such a complex product as a helicopter requires considerable hand labor. Preparation of the machine prior to painting takes a large amount of both floor space and man-hours. Painting is on a job basis, with any given helicopter requiring two or three different colors of enamel, lacquer or epoxy. The newly painted surfaces also require protection during the initial drying time, and therefore, helicopters could not be moved for some time.

To solve the problems of space, time, paint selection, and wet paint protection, two parallel painting lines were installed in a 17,500 sq ft paint shop addition to the main plant. Four helicopters are placed in line between the rails of a motor-driven, self-contained traveling paint booth. All four helicopters receive a zinc chromate prime spray as the booth travels over each ship.

Coats Applied in Sequence

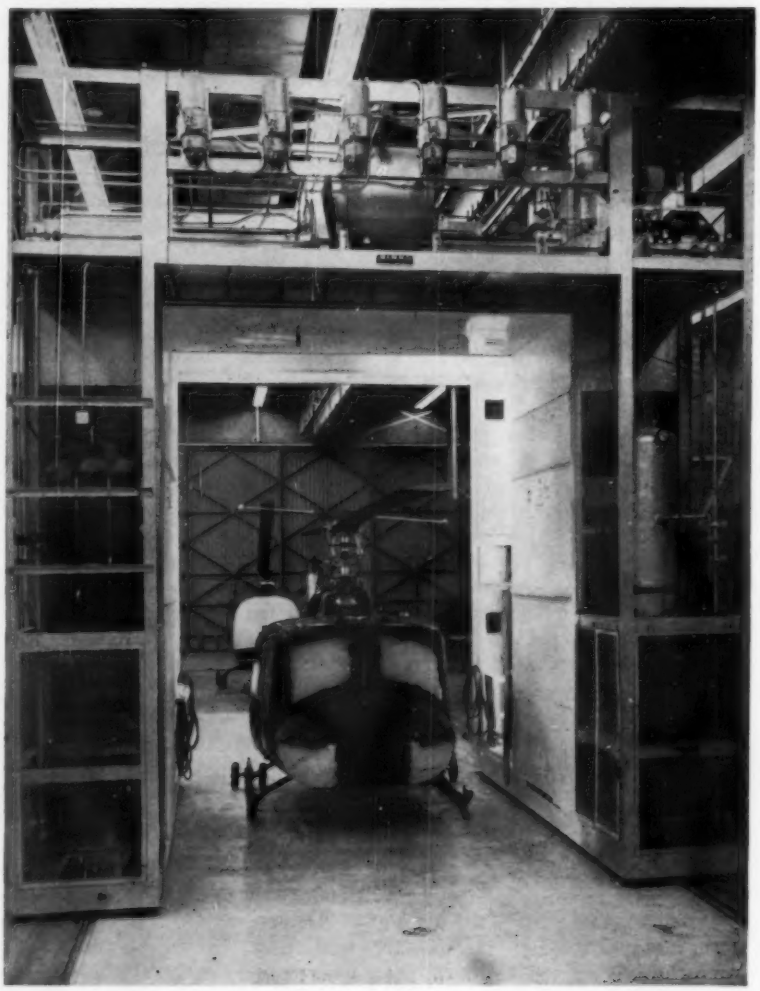
Following completion of the prime coat on the last helicopter, the paint booth is moved to the first ship in the line, which is now dry enough to allow application of the first finish coat of enamel, lacquer or epoxy. These coats are applied in sequence, one coat of one color at a time to each of the helicopters.

At the end of second pass, the paint booth is brought back to the first ship and another coat or color applied. This continues until all colors and coats have been applied, at which time the helicopters (four per line) are moved on to the flight hanger.

Both paint booths themselves are equipped with all the components necessary for a complete painting system. Spray guns, oil and water extractors and paint pots are provided. A seven and one half-horsepower air compressor and a receiver is mounted on each booth to provide air. An elevating work platform, driven by a two-hp hoist motor, is provided on each side of the booth to facilitate painting the top of the helicopter.

Booth travel is controlled from either work platform by moving a lever which controls the output direction of a three-hp electric-

Fig. 1. Power is transmitted to track wheels from overhead hydraulic drive.



ally-driven hydraulic power unit, mounted on the top of the booth. An upper cross shaft chain, Fig. 6, driven by the hydraulic unit, drives a 90-deg speed reducer mounted above vertical drive shafts on either side of the booth. The lower end of each vertical shaft drives a second 90-deg speed reducer coupled directly to a short horizontal cross shaft carrying a sprocket, which in turn chain drives one of the three axle-mounted double-flanged wheels on each side of the booth.

The basic booth design is of the water-wash type, using both forced and induced ventilation of the spray area. Overhead air source draws its supply from the building by a two-horsepower blower. This air is directed downward into the spraying area through filters located below the plenum chamber.

Two, five-horsepower booth exhaust fans, one on each side, draw the air supplied from the overhead, together with air induced through the open ends of the booth, through waterfall type washers, located on either side of the mobile paint booth.

Water circulated through each washer by five-horsepower centrifugal pumps catches suspended paint particles in the air and washes them into collecting tanks on either side of the booth.

Special Exhausting System

Air exhausted through the two water washers is discharged outside the booth and building through an ingenious trunk duct exhauster system. A 53 in. by 56 in. duct is suspended below the building roof over the entire track length of each booth. Each duct is exhausted by three, 21,000 cfm roof mounted exhaust fans.

Air exhausted from the paint booth is admitted into the trunk duct through a series of 12-in. long duct-width, damper blades. These damper blades form the entire bottom surface of the duct. Each blade is pivoted about a shaft having a curved actuating lever formed on one end. See Figs. 2 and 3. This lever together with the blade weight, combine to make the damper normally closed. As the paint booth air exhaust fan outlets

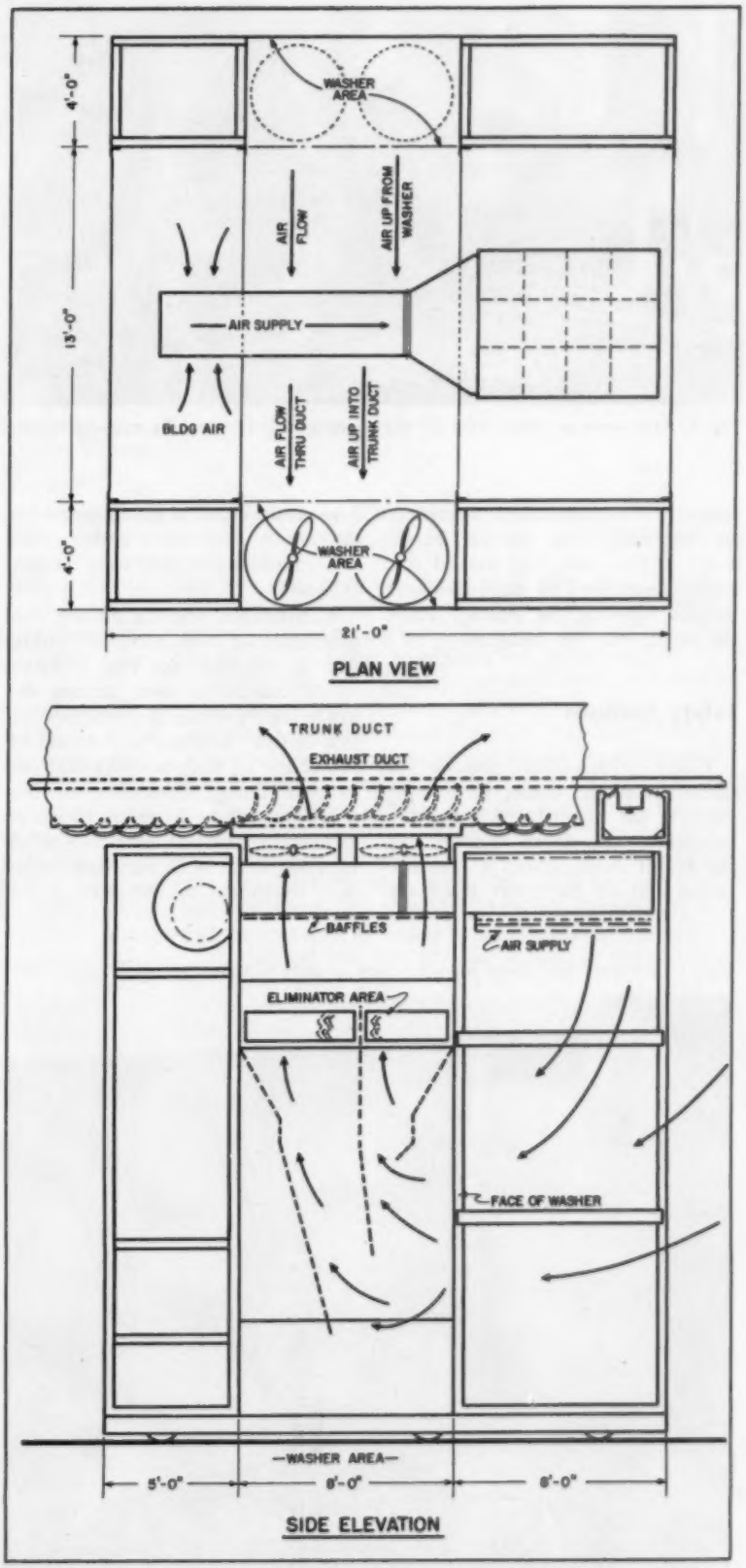


Fig. 2. Simplified views of the mobile paint booth give general idea of design. Air from the work area enters the waterspray chamber at each side of the mobile spray booth. Propeller fans exhaust washed air into overhead trunk duct.

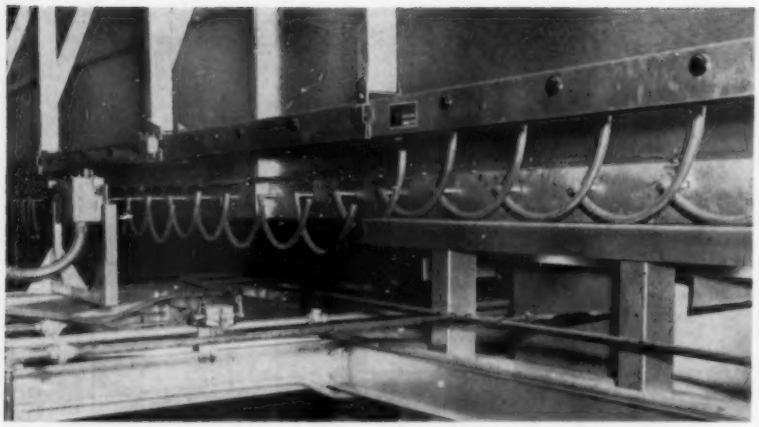


Fig. 3. Arcs serve as crank arms for the opening of louvers in the exhaust trunk.

appear below successive dampers, an operating arm on the booth bears against the cam shaped actuating lever end of each damper, thereby opening the passage from the booth into the trunk duct.

Safety Features

Electrical interlocks provide for operation of the center trunk duct exhaust fan together with the fan nearest to the booth location. As the booth moves closer to the opposite end of the trunk duct, the fans alternate. The fan nearest to the booth operates together with the continuously operating center exhauster.

Conventional carbon dioxide fire protection for both booth and trunk duct is provided. See Fig. 1. Each booth carries its own carbon dioxide supply which is controlled by rate-of-rise indicators, to afford protection of both washers and the exhaust ducts. Protection of the trunk duct along its entire length is provided by carbon dioxide nozzles supplied from wall mounted cylinders controlled by detectors in the duct. Electrical controls are interlocked so as to shut down all exhaust fans in case of fire.

To provide separate fire protection for the articles being painted within the booth, Bell engineers in cooperation with Factory Insurance Association specialists, developed a unique application of the booth waterfalls. Heat detectors mounted over the work area will, in event of fire in the area, actuate a separate two-horsepower motor-driven centrifugal pump which pumps water from both waterfalls through open sprinkler heads mounted throughout the work area. See Fig. 5. The normal waterfall capacity will provide approximately five minutes of protection. A fire hose connection to the waterfall tanks can be connected to nearby building hydrants for a continuous water supply.

In the event of fire in the overhead trunk duct, a combination of a pressure switch actuated by discharge of the trunk duct carbon dioxide extinguisher and a time delay relay will provide power to the waterfall extinguisher pump motor, while shutting off the trunk duct exhaust fans.

Electrical power for all booth operations and lighting is supplied from a 440 v, three-phase, 60 cy, trolley duct. **End**

Fig. 5. Separate fire pump stands ready to supply water to booth sprinklers.

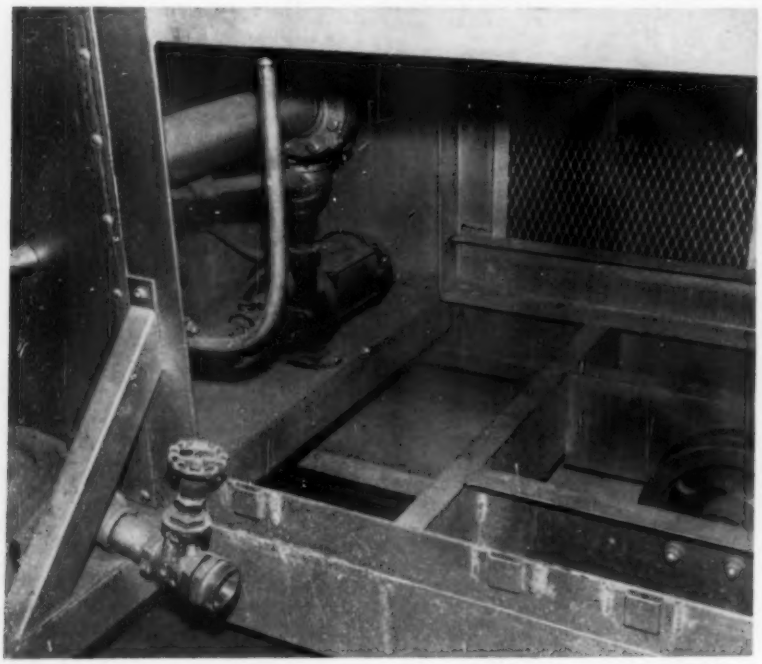


Fig. 6. Drive shaft is at booth's top.

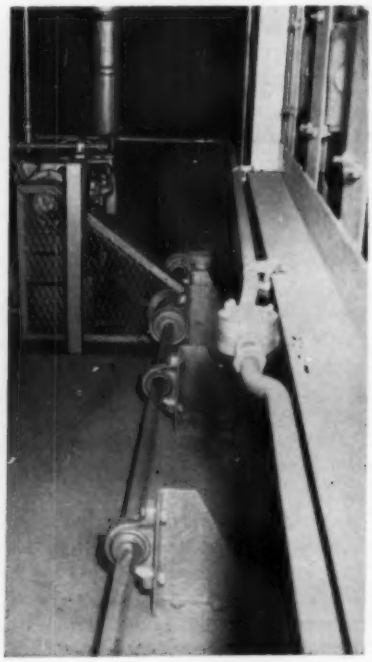


Fig. 1. Committee in "formal" session. L to r, Scaglione, Belobrajdic, Schneider, Woods, Nachefski, Vahle, Thomas.

SAFETY BY COMMITTEE

Solution to a safety problem: Let a committee of "users" study it. Monsanto did, and got results

By J. C. GOOD, Asst. to General Supt., Maintenance, John F. Queeny Plant, Monsanto Chemical Co.

LIKE MOST PLANTS, ours has a procedure manual; and like most plants, part of the manual is devoted to safety. Unlike many plants, we feel, we are constantly doing our best to live up to the concern for safety expressed in our manual.

Like most chemical plants, ours is made up of a series of closed kettles and tanks, connected by miles of pipe bent into almost every conceivable shape. Normal operating procedures require that workers enter these tanks periodically to clean, repair or revamp them as production demands change. This can be very hazardous work; the nature of the product, the fumes encountered, and the product lines leading into the tank are among any number of specific risks invloved in entering tanks.

Entering tanks is also covered by procedures. They explain how and why the incoming lines are blanked off, how and why all electrical equipment on the tank is locked out, and specify that the mechanic who works inside the tank must wear a safety wrist harness so that, if necessary, he can be pulled from the tank to safety by a "tank watcher."

Sounds foolproof—and it is, almost. But, with all the prior precautions, when a mechanic enters a tank his life depends on that safety harness. And that was our problem. The mechanics, with good justification, did not like the wrist harness: "it's too cumbersome—the lines are always in my way," "I can't get my welding gloves over the harness," and other similar complaints were heard. They didn't like it and whenever possible avoided wearing it.

"Ask the Man Who Wears One"

The logical solution to the problem was to find or develop a harness that would suit the needs of the job, yet be acceptable to those who had to wear it. It was decided to let the people who had the most serious objections contribute to the design.

A committee of seven mechanics, one a foreman, was formed. It included representatives of the following groups: weldors, millwrights, pipefitters, tinners, lead burners, riggers and carpenters. All these men had intimate knowledge of the problems involved. The committee was given complete freedom and authority to do the job; red tape wasn't just cut, it was slashed.

Slowly, the idea of safety vest developed. A vest had many advantages. A man could wear it without it interfering with his normal duties; it was comfortable; it was safe and it was, in the opinion of the people who had to wear it, very practical.

The committee decided that the vest should have a smooth back to eliminate the possibility of catching on equipment within the tank. Also, it should have two size adjustments—one at the waist for better fit, and one across the chest to prevent it slipping off an unconscious man as he was being lifted in it.

A proposal that the "lifeline" should be attached to an O-ring sewed into the back of the vest was judged not practical for two reasons: it would be uncomfortable for a man working while lying on his back in a tank; it was possible to pull an O-ring loose from the

Fig. 2. Committee gathers around drawing for "chalk talk."

Fig. 3. Front and rear views of safety vest OK'd by group.

Fig. 4. Committee members demonstrate rescue procedure.

vest. To solve this problem, a stainless steel plate was cut and formed to fit the contour of a man's shoulders, a hole drilled in the plate, and the plate sewed into the vest.

A hook that could be quickly attached to the plate was fabricated by one of the machinists, using the design of a hook submitted by a rigger. With this, the final design was complete, and an experimental vest was made for test. Made of nylon, because of its acid resistance, and because nylon can be stored for long periods of time without deterioration, the vest was sewn with plastic-impregnated thread that added strength to the garment.

Field tests, using committee members as "guinea pigs" showed that the vest would comfortably and safely support a 265-lb man in a five-foot drop, and would support 800 lb of dead weight load.

In a demonstration for the General Superintendent of Maintenance and the Safety Director, the committee removed a man (without his assistance) from a 12-ft-high tank, through a 19-in.-diameter manhole, in only 11 seconds. The previous record for such a removal, with the wrist harness, was one minute and 17 seconds.

Subsequent demonstrations, presented in a tank mockup, convinced the 450 employees who might be required to wear the harness, that the committee "had something." The vest has been accepted without reservation and is a constant reminder that safety can be a committee job—particularly when the committee is made up of the men whose lives are at stake. **End**

CONSTRUCTION COST ESTIMATING— REVISION OF PART V

IN THE November 1959 issue of PLANT ENGINEERING, Part V of the Construction Cost Estimating series included cost figures for the erection of corrugated asbestos siding. The cost which our author had been using in his own estimating work—and therefore the cost used in the article presented in PLANT ENGINEERING—was $0.719 per square foot.

Since publication of the data, several people have pointed out that this figure is too high. Inasmuch as our author is now revising his own estimating figure to reflect the lower cost ($0.574 per square foot), we are reprinting the table in which the figure was used, so your estimates will not be unduly high.

During his investigation, our author also up-dated other figures in his table, and added figures relative to the use of corrugated plastic siding. To present this new material, and the revised material, we felt it best to reprint the entire page. This replacement page can be clipped, and placed in your files. If, like many of our readers, you have requested a copy of the reprint of the entire series, we assure you that the revised cost figures will appear in that booklet.

The revised material, including the new cost data, appears on the following page. Clip it, if you're keeping looseleaf files of the series, and mount it over the original.

time saver series

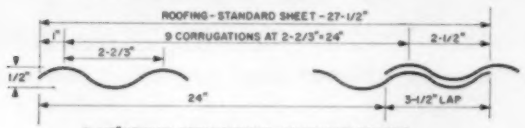
CONSTRUCTION COST ESTIMATING PART 5

SIDING AND WINDOWS

Galvanized corrugated steel siding is widely used in the construction of steel mills, manufacturing plants and warehouses. Most commonly used corrugations are 1¼ in. and 2½ in. A 28-in.-wide flat plate corrugated, with 2½-in. corrugations produces a 26-in.-wide sheet. In structural steel framing the sheets are fastened by clips, Nelson studs or drive screws.

On galvanized siding the minimum end lap is 2 in., standard 4 in. Minimum side lap is 2 in., which leaves a weather-exposed width of 24 inches. Fasteners are spaced every 4 corrugations and the side lap fasteners every 12 in. Using a swing stage a three-man crew can put up 800 to 1000 sq ft of material a day.

2-1/2" NOMINAL CORRUGATIONS - GALVANIZED SIDING

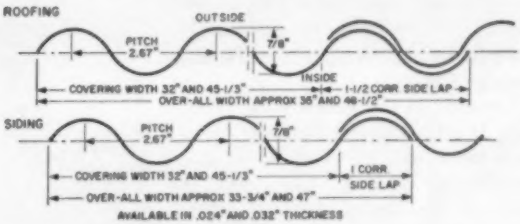


2-1/2" NOMINAL CORRUGATIONS - GALVANIZED ROOFING

Siding comes with both end corrugations down; roofing comes with one corrugation up and the other down. Roofing is laid with a side lap of 1½ corrugations and a minimum end lap of 6 in. for a roof pitch 4 in 12 or over. For roofs of less pitch the minimum end lap should be 8 in. Corrugated steel roofing is seldom used for roof pitch under 3 in 12.

Aluminum

Corrugated aluminum is being used a great deal, either in sandwich wall construction or a single sheet with an insulation backing. The same fastener spacing is used as with galvanized sheets.



The following are some of the current prices for installing various types of siding—actual area:

Corrugated Galvanized, 20 ga.	$0.477 per sq ft
Corrugated Galvanized, 22 ga.	0.448 per sq ft
Corrugated Galvanized, 24 ga.	0.417 per sq ft
Corrugated Aluminum, .032-in. 48⅓ in. sheet	0.599 per sq ft
Corrugated Aluminum, .032-in. 35-in. sheet	0.608 per sq ft
Corrugated Asbestos, ⅜-in.	0.574 per sq ft
Corrugated Plastic, Reinforced, 1/16-in.	0.930 per sq ft

SIDING

Table I. Cost per 100 sq ft of Installed Siding

	Aluminum		Galvanized			Asbestos	Plastic
Pitch—in.	2.67	2.67	2.5	2.5	2.5	4.2	2.5
Thickness—in.	.032	.032	20 ga	22 ga	24 ga	.375	.06
Weight—lb per sq ft	.56	.56	1.78	1.51	1.25	4.0	8 oz
Width of sheet—in.	47	33.75	26	26	26	42	26
Coverage—in.	45⅓	32	24	24	24	38	24
Side lap—corrugations	1	1	2 in.	2 in.	2 in.	1	2 in.
End lap—in.	4	4	4	4	4	6	4
Maximum length of sheet—ft	14	14	12	12	12	12	12*
Cost of sheets per sq ft	.32	.32	.201	.175	.148	.30	.65
Cost of fasteners per 100 sq ft	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Sq ft of material per 100 sq ft of area	109	112	113	113	113	108	113
Cost of material per 100 sq ft of area	34.88	35.84	22.71	19.78	16.72	32.40	73.45
Labor cost per 100 sq ft	20.00	20.00	20.00	20.00	20.00	20.00	15.00
Total cost per 100 sq ft of area	**59.88**	**60.84**	**47.71**	**44.78**	**41.72**	**57.40**	**93.00**

Add $5.00 to total cost per 100 sq ft if filler (closure) strip is used.
Add $5.00 to total cost per 100 sq ft for caulking or clear lap cement.
Flashing around windows and doors: 26 ga, $0.60 per ft, installed. Corners: installed, $0.75 per lin ft.
Stainless steel screws, neoprene washers used to fasten sheets to girts: ½ in. long, $0.04; ¾ in. long, $0.05.
*One manufacturer produces corrugated plastic sheets up to 24 ft in length.

Allis-Chalmers Has Well-Equipped Building for . . .

AIR COMPRESSOR TESTING

By F. H. RASSMAN, Compressor Department, Allis-Chalmers Mfg. Co.

ALTHOUGH in operation only a little over a year, Allis-Chalmers compressor test facility today plays an important role in all of the company's compressor activity. Many tests have been successfully recorded at the facility since the initial mechanical testing of a 10-stage, 125,000/165,000-cfm axial compressor for Wright Air Development Center.

Located at the firm's West Allis, Wis. Works, the test building has a total floor area of 8250 sq ft. Approximately half of this space is taken by the turbine and pits, while the remaining area is used for assembly of units prior to erection on the pit. As of now, there is one drive turbine, but space has been allowed for another. A 30-ton capacity crane is available in the building.

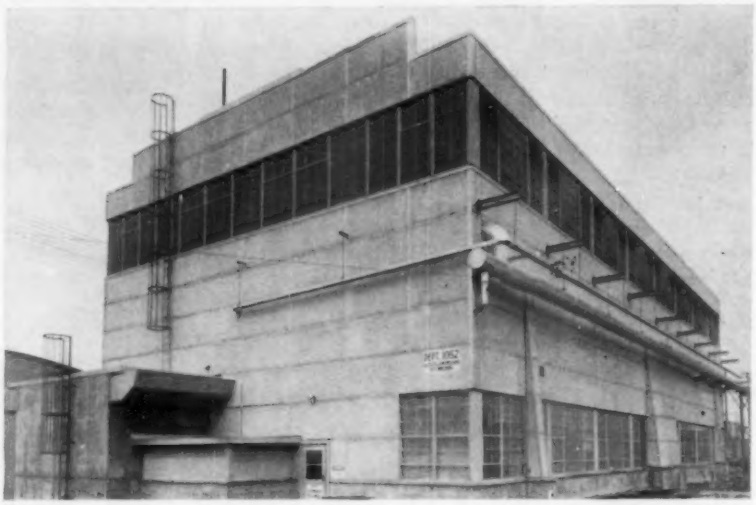


Fig. 1. Structure built for testing equipment has a floor area of 8250 sq ft.

The facility is fitted with permanent air inlet and discharge piping. The air enters and leaves the building through separate silencing chambers which have a damper between them to allow heating the inlet air with hot discharge air to any desired inlet temperature above ambient.

Air can be throttled at either the inlet or discharge by means of butterfly valves in the inlet and discharge piping. Connecting flanges on the air piping at both the top and bottom of the pit accommodate units with up or down nozzles.

A compressor under test is supported by two main beams running across the pit parallel to the centerline of the turbine. The distance between the main parallels may be varied to fit the distance between the feet of the compressor.

The top of the parallel is at the floor level, 36 in. below the turbine centerline. The vertical distance between the compressor feet and the main parallel is bridged by means of a small parallel and an adjustable leveling block under each foot. This method facilitates rapid pit change from one size unit to another.

The drive turbine, Fig. 2, is coupled to a double-output gear which is used for rotation reversal. This gear has a 1.01 to 1 ratio to prevent uneven tooth wear. The turbine has a speed range on the governor of 600 to 12,000 rpm and develops a maximum of 3800 hp at 9000 rpm.

Turbine overspeed trip is set for 13,100 rpm. A secondary overspeed trip, which can be set at any speed desired to protect the compressor being tested, is a feature of the turbine. The turbine is designed to handle a maximum of 75,000 lb of steam per hour at 150 psig and 450 F total temperature. It exhausts to an atmospheric condenser.

Two independent lubrication systems, one for the drive equipment and another for the compressor being tested, are installed. The drive equipment system is set for the relatively fixed conditions of the turbine and gear and requires no adjustment.

The compressor lube system is a more detailed one and needs some explanation.

The system can be regulated for the varying pressure and temperature requirements of the different compressors. It has a twin oil reservoir so that either 150 SSU or 300 SSU oil can be supplied, depending on the design of the compressor bearings.

Main pump is motor driven and the auxiliary pump has a steam turbine drive which is automatically energized should the main pump fail. The lubrication system has a filter and cooler and has provision for heating the oil in the reservoir. Supply and drain headers are at the edge of the pit, with flexible hoses supplying the unit from these headers.

Although the pit is physically large enough to accommodate a 160,000 cfm, 5-stage centrifugal compressor; or a 280,000 cfm, 10-stage axial compressor, units of this size have horsepower requirements which exceed the capabilities of the present turbine and can be tested mechanically only by (1) evacuating the casing or (2) removing the diaphragms or the stator assembly.

Available horsepower permits complete performance tests to be run on units with inlet volumes up to 125,000 cfm by throttling the inlet and discharge to atmosphere. This maximum varies with the pressure ratio and efficiency of units.

Performance tests with discharge throttling can be run on units with inlet volumes up to 40,000 cfm, again depending upon the pressure ratio and efficiency of the individual unit.

A second capability which approximately coincides with the maximum available horsepower, is the air piping capacity. The maximum air flow that can be handled is approximately 40,000 scfm.

Facility air piping has been designed so that instrumentation can be made in accordance with the ASME Power Test Code for Compressors and Exhausters. This includes such items as the proper length of straight pipe upstream of nozzles, flow straighteners ahead of nozzles, and the proper length of straight pipe to the inlet and discharge of the compressor.

Air flow is measured by means of standard ASME long radius flow nozzles which can be placed either in the inlet or the discharge piping.

Pressures are measured by Kiel probes indicating total pressure and are recorded from mercury or water manometers, depending upon the pressure level.

Temperature Sensing

Temperatures are sensed by shielded iron-constantan thermocouples and are read from a multi-point temperature indicator. See Fig. 3. The over-all accuracy of the thermocouples and temperature readings is approximately + 1.5 F.

Power measurements are made by means of an optical torquemeter. It is comprised of two hollow concentric rotating shafts, the inner shaft carrying no load. See Fig. 4. The angle of twist between the shafts is measured by means of a telescope and collimator and an internal arrangement of mirrors, much like a sextant. The accuracy of the torquemeter is approximately 0.25 per cent.

Speed is measured by means of an electronic counter with a magnetic pick-up. The pick-up is mounted in close proximity to the rotating shaft which has 60 circumferential notches. The number of interruptions over a one second time base is counted by the instrument. The accuracy of measurement is ± 1 rpm over the entire speed range. **End**

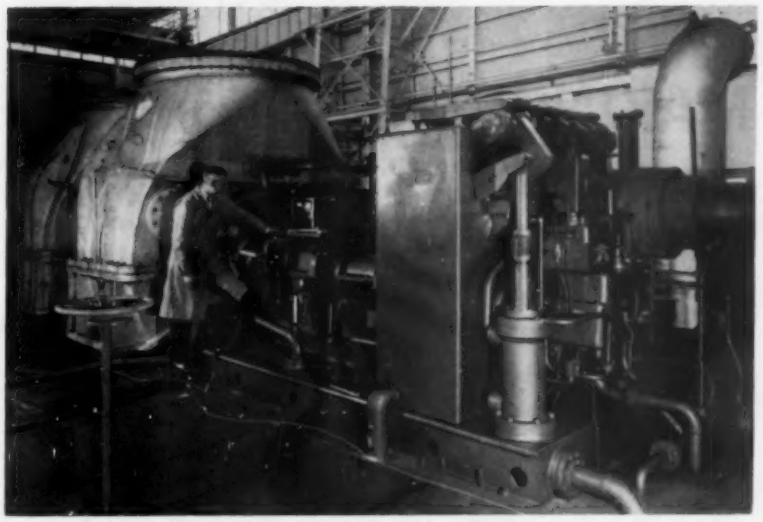


Fig. 2. A 285,000-cfm unit linked with steam turbine for performance testing.

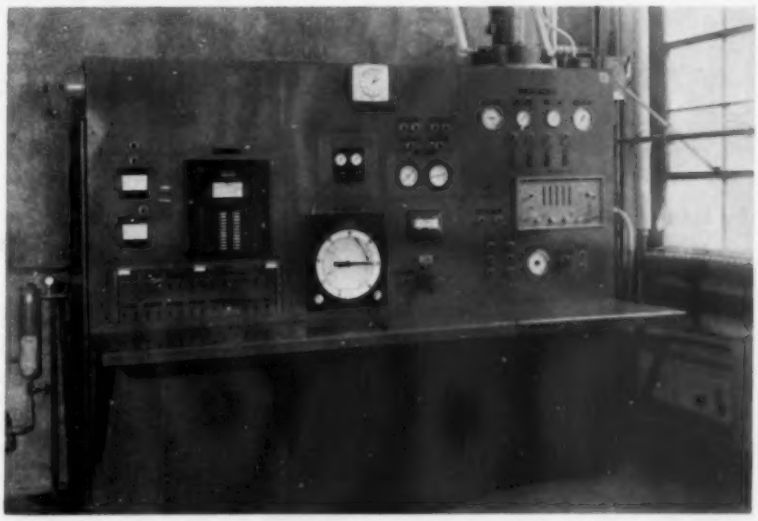


Fig. 3. Console includes multi-point temperature indicator and an rpm counter.

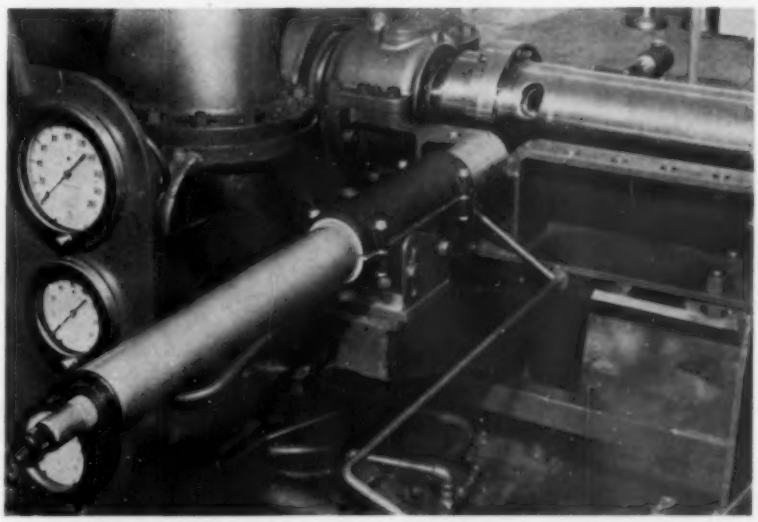
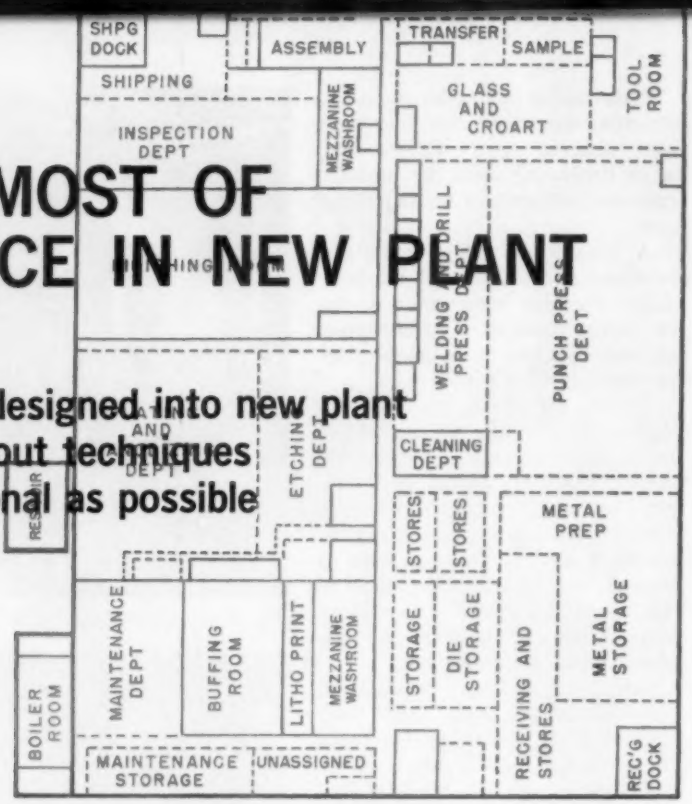


Fig. 4. Optical instrument is used to check torque; load is on outside shaft.

MAKING THE MOST OF SPACE IN NEW PLANT

Many specials were designed into new plant plus the latest in layout techniques to make it as functional as possible



By **HARVEY FARRINGTON, Plant Engineer, Croname, Inc., and WILLIAM HEINKEL, Chief Architect, Graham, Anderson, Probst & White, Inc., Architects and Engineers**

EVERY LARGE business was once small. This is true of Croname, Inc., which grew from a very small nameplate house to one of the largest aluminum anodizing, processing and stamping plants in the country. The company now manufactures all kinds of metal decorative parts for the automotive and appliance manufacturers, as well as printed circuits for the electronic industry.

As the company grew it developed many diversified processes, necessitating increased areas and facilities. Because of its central location in the city of Chicago we were forced into a multi-plant, multi-floor operation. In a job shop where processes are constantly changing this is more than a hindrance. Along with the increase in production and the ever-growing parking problem, expansion was necessary, but because of our location, it was next to impossible.

To remedy these troubles we have built a new plant in the nearby suburb of Niles, Illinois. It is a single floor, single plant, that has already shown substantial savings.

A glorified job shop is in itself a problem, but the unique part of Croname, Inc., is its immense wet process area, a special finishing area, and the ever-present ventilation problem connected with these two processes. The layout of machining was "mine run" but corrosion and ventilating problems increased the project four-fold.

Preliminary Details

The plant engineer was instructed to work out the preliminary details. Flow process was ascertained—block plans were made—then finally a complete plant layout was made. Lighting was studied and tests were made. Corrosive material was extensively studied and tried. There was considerable time spent by management in selecting the architect.

When Graham, Anderson, Probst & White were selected they sent in their engineers to work with the plant engineer and production management. The preliminary data required three years and it took another year for the architect to consummate the necessary data.

As a result of all this preplanning the company has been able to increase all department areas but three and double the office area in the new plant. The former plant occupied 317,000 sq ft; the new plant, 358,000 sq ft.

Because the old plant was a multi-plant, multi-floored operation, much space was wasted. In addition, extra time was spent in moving equipment-in-process from operation to operation and floor to floor. The single floor arrangement in the new building permitted us to employ the latest in layout techniques and, as a result, take advantage of all available floor space in each area.

Other features incorporated in the final plans were: special structural material in the wet process area; rubber-lined tanks were specified for the tank farm; in the wet process area the floor was dropped so tanks would be at working level; and special attention was given to ventilation. These and many other ideas have helped to improve operations and reduce maintenance.

Here is a brief description of a

number of ways in which all these things were accomplished:

1. Areas were studied along with the sequence of operations.

2. Each piece of equipment was studied for facilities and catalogued.

3. Special attention was given to the type of structure, not only to house the project, but to reduce the maintenance and operating costs to a minimum. For instance, in the wet area the roof is pre-studded concrete slab to protect against moisture. The rest of the plant roof is of gypsum construction. Even painting was considered—acidproof paint is used in all the corrosive areas.

4. Restrooms were located in mezzanines so as not to use up floor space.

5. A tank farm was laid out for all solutions used in large amounts. Solutions were piped from these tanks through pumps to the best locations in the plant for their use. Pushbutton stations were located at the dispensing point for ease of dispensing. All material for these systems had to be considered. Stainless steel tanks were installed for nitric, sulfuric and phosphoric acids. Rubber-lined and Boltaron tanks were installed for muriatic acids. Solvents could all be handled by steel. Chempumps were used on acids to reduce packing gland troubles.

6. Steam was considered. The low pressure—8 to 10 lb—steam invited troubles. To reduce any possibilities of trouble, we are using 125 lb steam in the new plant. It is manufactured by two water tube boilers of 40,000 lb capacity. In the wet process tanks, 35 lb steam is used and in the driers, 125 lb.

7. Mains for process water and high pressure air were laid out in loops covering the main section of the plant. This was to insure even pressures and volume anywhere in the plant.

8. Electrical requirement was considered. We are using 440 volts, except for spot welders. This gave considerable reduction in installation costs and line-loss throughout the plant. A good portion of the lighting was set up at 277 volts for the same reason. Bus duct was used to expedite installation and provide for flexibility in the future.

9. It was necessary to sink a well for process water as the city could not furnish the million and a quarter gallons per day the plant required. The well is 1500 ft deep with a 350-hp, 2200-volt pump hanging at the 750-ft level. It produces 1400 gpm. Because of two sources of water, well for process and city for sanitary, the engineers had to do quite a bit of juggling to get the two separate water systems into the plant layout.

10. Very special attention was given to ventilation. It was found that one million cubic feet of air was exhausted per minute. Makeup air came into the picture immediately. To air condition any place but the office was out of the question. Croname was faced with several problems—dust and dirt in and around the buffing operation and corrosion from acid fumes, also dirt from other sections in the finishing areas.

First, the systems were designed to more than meet state health requirements. Makeup air was supplied so that the finishing areas had a positive pressure to keep dirt out while buffing and wet areas were given a negative pressure to keep dirt and fumes in.

After considerable research it was decided to use rigid PVC Boltaron for all corrosive duct work. With low-heat welding the ducts are tight and no condensate seeps through and drips. Any repairs or changes are simple. All exhausters are coated or stainless. Push-pull systems are used on large tanks with good results.

All spray booths are dry. A special collector was designed by the plant engineer to collect paint fumes. The expansion theory was used. The air through the duct comes into a large chamber, slows by expansion and drops out its solids. Expanded mesh screens collect over 90 per cent of the rest. The fan is on the far side, pulling the air through the chamber. Very little cleaning is required. Surprisingly the residue is in a dust form. Makeup air, 750,000 cu ft of it, is forced in from the penthouses. Temperatures are automatically controlled. Positive pressure in the finish room is also automatic.

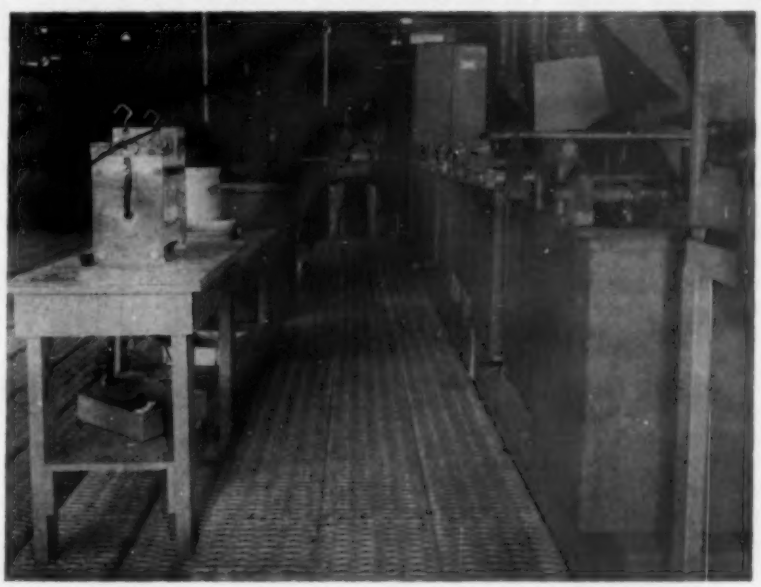
Features of Wet Process Area

11. Last, but far from least, is the wet process area. Wherever the tanks were deep the floor was dropped so that all tanks could be set at a 33 in. working level above the plant floor. Every possible type of wet floor was considered. The result was a Swedish process called Ferrolite.

Floors were drained to the center of the bays and a Duriron drain and trap were installed—running into a

(Continued on page 256)

Grating is used in wet process area to reduce possibility of falls and permit aeration to help cut down on rust and corrosion. Note plastic hoods and ducts.



HOW TO DESIGN

PNEUMATIC-HYDRAULIC ACTUATION SYSTEMS

FIFTH IN A SERIES OF ARTICLES

Part V. Designing a pneumatic system for a reciprocating cycle controlled by adjustable timers

MACHINE APPLICATIONS using a reciprocating cycle are quite numerous. In some applications the tool is moved back and forth across the work, in other applications the workpiece is moved back and forth across the tool and in still other applications both the tool and the workpiece are reciprocated. Among these applications are brushing, sawing, grinding, polishing and dipping.

Pneumatic power readily lends itself to this motion, generally produced by double-acting air cylinders or air-hydraulic cylinders. In designing these reciprocating motions, it may be desirable to have a controlled feed rate in one direction and fast retraction or controlled feed rates in both directions. These reciprocating motions can also be combined with other motions to make completely automated operations.

In Fig. 1, we show the schematic pneumatic control for a brushing application which clamps the work, moves a brush up and down for a timed interval, unclamps the work and automatically stops. The operator loads the workpiece onto the air-operated mandrel and momentarily depresses the electric pushbuttons PB-1 and PB-2, Fig. 2. This energizes solenoid valve S-1, directing air pressure to the rod end of cylinder X. As the piston retracts, at a speed set by flow control valve R, the mandrel firmly grasps the work.

Air pressure builds up in the line between K and S, closing contacts in pressure switch G. This energizes timer TD, causing all TD contacts to close. The pressure build-up also closes sequence valve L directing air to valve M. Timer contact, TD-b, completes a circuit to solenoid valve S-3 directing air to the blind end of the brushing cylinder Y. The piston of this cylinder descends at a rate controlled by flow control valve P.

At the bottom of the stroke, a cam operates LS-1, completing a circuit to solenoid valve S-4. This reverses the direction of air flow to cylinder Y and causes the brush to move up at a speed set by flow control valve Q. Near top of stroke a second cam operates LS-2, energizing solenoid valve S-3. This reverses the air flow

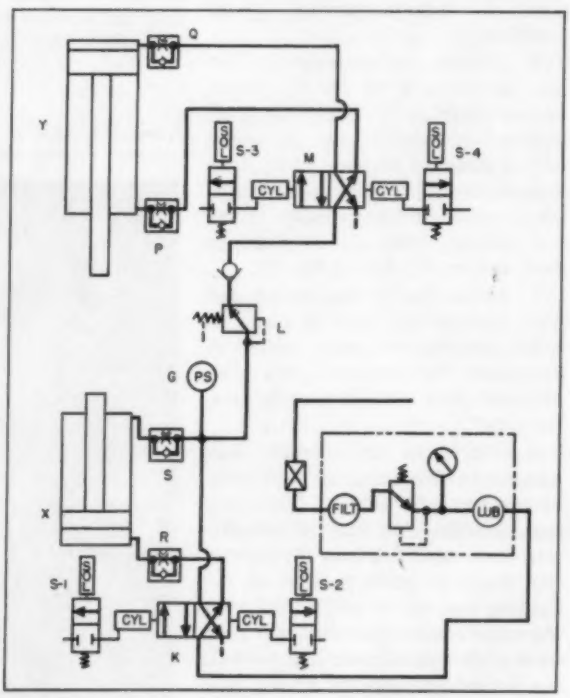


Fig. 1. Schematic of pneumatic control for a machine designed to clamp work and reciprocate brushes automatically.

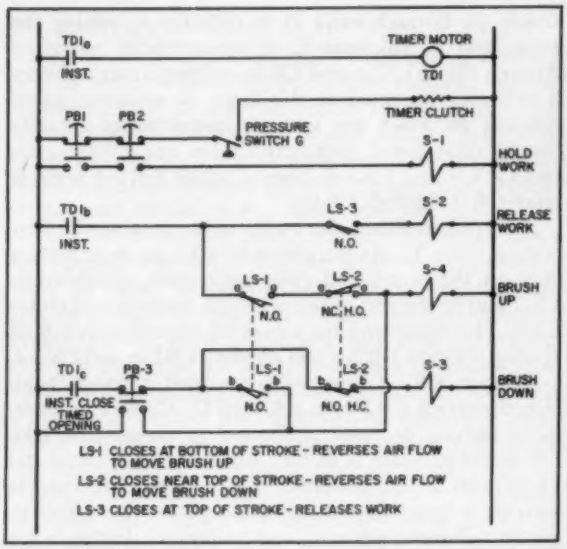


Fig. 2. Cycle is initiated when operator presses PB-1 and PB-2. PB-3 is emergency pushbutton used to raise brushes.

Fig. 3. Cylinder Y and limit switches are shown at top of machine. Work clamping cylinder X is located below table.

to cylinder Y and the brush moves down again. This action is repeated until the timer TD, times-out, opening contact TD-c.

If the timer times-out on the descending stroke, the stroke will be completed and the cylinder will reverse at the bottom of the stroke as before. On this upstroke, cylinder Y will continue on up until a third cam operates LS-3. This energizes a solenoid valve to reverse air flow to the work clamp cylinder X, releasing the workpiece. The resultant drop in air pressure at G opens the air pressure switch and resets the timer for the next cycle.

If there is need for an emergency reversal of the brushing cylinder piston on the downstroke, operator depresses pushbutton PB-3 and piston of cylinder X retracts. By changing the lengths of cam SS and PP, the length of the reciprocating stroke can be changed. SS limits the downstroke and PP the upstroke. In this application it is necessary that the mandrel cylinder produce enough force so that there is no possibility of the workpiece being stripped from the mandrel.

Figure 3 shows a complete machine for performing the work. Note that the mandrel is located high enough from the machine bed so that the brush head can pass completely over the mandrel to allow the brushes to be free at the end of the stroke. This provides the same brushing action in both directions. The cam on the rod on the right side of the press can be adjusted to provide different strokes on the brushing cylinder.

Where large cylinders, such as the brushing cylinder, are used it is well to cushion them in order to relieve stresses and eliminate noise at end of stroke. In the example shown only the blind end of the cylinder is cushioned since the piston does not contact the front cover.

In applications where highly volatile fluids are present or where there is an explosive atmosphere, elimination of electric valves is sometimes desirable. This application, Fig. 4, pertains to repeated dipping of a basket full of workpieces into a tank.

The designer has a choice of using bleeder type controls, pressure type controls, or a combination of both of these. In this particular application we are using a basic circuit and have chosen the bleeder type controls. The piston of basket cylinder C is normally in the re-

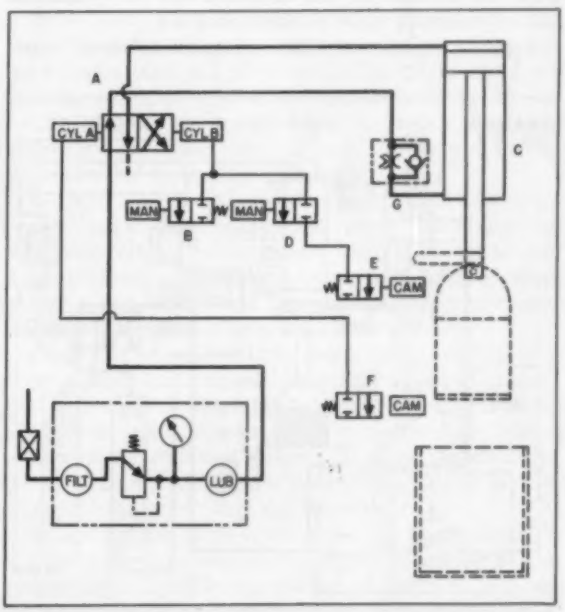


Fig. 4. Applications employing volatile liquids or located in hazardous atmospheres can use this non-electric design.

tracted or loading position. Workpieces are loaded into the basket.

Operator momentarily depresses handle of valve B allowing air pressure to bleed off of cylinder chamber B of four-way valve A. This causes spool of valve A to shift, directing air pressure to blind end of cylinder C. Piston of cylinder C descends at a speed set by flow control valve G until basket is submerged in the liquid and cam on piston rod depresses cam roller of valve F. When cam roller of F is depressed, passage in valve F is opened, bleeding air pressure from cylinder chamber A of valve A causing spool to shift and air pressure is directed through the free flow passage of G into rod end of basket cylinder and basket retracts.

How Basket Moves In and Out of Tank

Now to reciprocate the work in and out of the tank, operator shifts handle of two-way valve D which opens the passage between cylinder chamber B and valve E. He then momentarily depresses handle of valve D which causes spool in A to shift directing air pressure to blind end of cylinder C. Piston moves down and cam rides over cam roller of valve E, but since this line has already been bled when valve B was actuated nothing happens. When cam contacts cam roller F, spool of valve A is shifted and air is directed to rod end of C and piston starts to retract. When cam on piston rod contacts cam roller E, line to cylinder chamber B is bled and spool of valve A shifts, directing air pressure to blind end of C. Cam on piston rod of C will reciprocate between valves E and F until operator returns handle of valve D to original position, then piston of C will fully retract completing the cycle.

Although there are only two cylinders involved in Fig. 5, the electrical circuit, Fig. 6, is somewhat more complicated than previous designs. The only work required of the operator is to make connection between the work basket and the end of piston rod of cylinder A and momentarily press pushbutton PB-1.

Pressing pushbutton PB-1, energizes solenoid B and directs air through valve D to cylinder A, raising the work basket. Solenoid C is momentarily energized through PB-1, LS2-a and CR1-a to make sure cylinder B will stay retracted at this time. A separate set of contacts on PB-1 are used to momentarily energize control relay CR-1. Contacts CR1-a and CR1-c open and CR1-b and CR1-d close. Contact CR1-d seals in relay CR-1 through LS-6.

Air pressure raises the basket at a speed set by flow control valve Y. As the piston of cylinder A retracts, a cam on the piston rod rides over limit switch roller LS-2 and at the end of the upstroke contacts and closes LS-1. This completes the circuit to control relay CR-2, closing contacts CR2-a and opening CR2-b and CR2-c.

Contact CR2-a completes a circuit through held-closed contact CR1-b to solenoid D. Valve F is energized and air pressure is directed to air-oil tank HH. Oil under pressure is in turn directed to the blind end of cylinder B. Oil chambers GG and HH are used to provide a hydraulic actuation to cylinder B so that its piston will move smoothly and to prevent drifting when stopped. Outstroke speed of piston B is controlled by flow control valve W. There is a two-way stop valve in the line between W and GG that had been previously opened. This was accomplished when contact CR2-b opened, de-energizing solenoid E.

At the half-way point in the traverse of piston B, limit switch LS-3 is contacted closing a circuit to the timer. As the timer coil is energized, contacts T1-a, T1-b and T1-c close. When contact T1-b closed, solenoid E becomes energized, closing the passage in stop valve J and piston of cylinder B is stopped.

When T1-a closed, solenoid A of valve D is energized

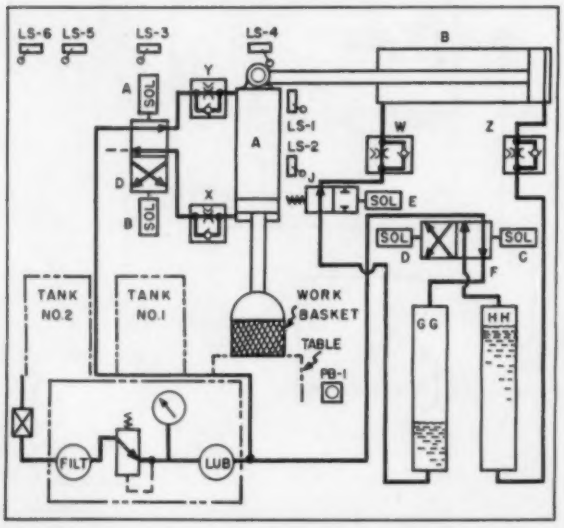


Fig. 5. Complex circuit, designed for fully automatic operation, uses hydraulic, pneumatic and electrical devices.

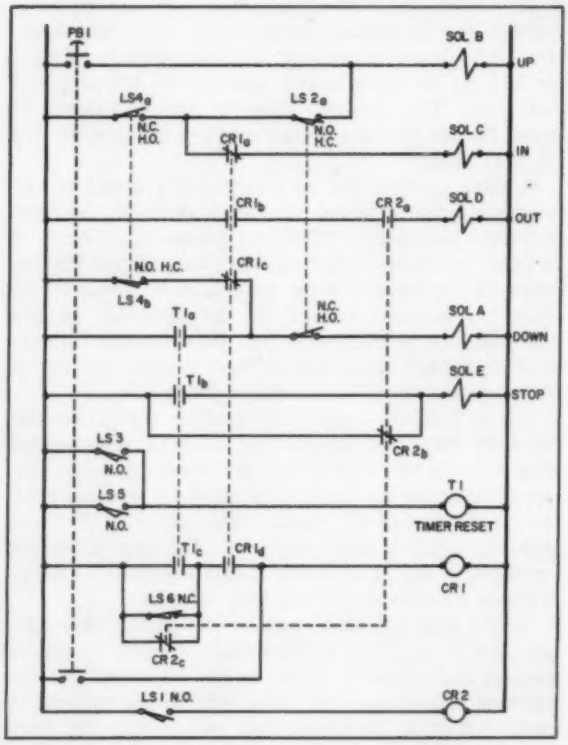


Fig. 6. Solenoid valves in Fig. 5 are controlled by relays timers and limit switches as shown in schematic diagram.

and air pressure is directed to the blind end of cylinder A. The basket is lowered into the first dip tank and the piston rod trips LS-2 at the bottom of the stroke. This opens contacts LS2-b and closes LS2-a, energizing solenoid B and the basket is raised until the piston contacts LS-2 again. When LS-2 trips on upstroke, circuits reverse and basket moves down into the tank.

This oscillation will continue until the timer times out, opening all the T1 contacts. If the timer times out when the basket is moving down, T1-b controlling the stop valve E will open but the circuit is maintained through contact CR2-b. The stop valve will not release piston B until the rod of cylinder A has reached the top position, closing LS-1 to energize CR-2. As CR-2 is energized, contact CR2-b opens, de-energizing solenoid E and the piston of the transfer cylinder B moves the work basket over to the second dip tank.

Near the end of the stroke, LS-5 is closed, energizing the timer again and the reciprocating cycle begins in the second tank for the timed interval. Limit switch LS-6 opens at end of transfer piston stroke leaving relay CR-1 energized only through timer contact T1-c.

At the end of the timed interval, the work basket is raised as before, relay CR-1 is de-energized and contact CR1-a closes to energize solenoid C returning the transfer cylinder to the starting position. When the piston is fully retracted, LS-4 is operated to open LS4-a, stopping the transfer piston and LS4-b closes, energizing solenoid A through the normally closed contacts of CR1-c and LS2-b.

Energizing solenoid A shifts valve D, directing air pressure to the blind end of cylinder A and the work basket lowers and stops on the table, completing the cycle. If it is desirable to have a different time cycle on the second dip tank than on the first tank, a second timer is connected directly to LS-3 and the common connection between LS-3 and LS-5 is removed.

Circuit Using Pressure Type Controls

Figure 7 shows a basic circuit similar to Fig. 4 but pressure type controls are used. This system will require more pipe connections since pressure lines must be connected to the three-way valves. The pressure lines to the three-way valves can be quite small in diameter, ⅛ to ¼ in. In order to provide a smooth even movement such as would be used in a grinding, polishing, or saw application, an air hydraulic cylinder is used.

After the work is loaded it is rapidly advanced to the reciprocating station, then reciprocated slowly due to the setting of the variable orifice in valve K. The oil must flow through this orifice when roller of valve K is depressed. On the completion stroke as soon as the roller of valve K is released piston M moves freely.

If it is desirable to have a semi-automatic cycle, one in which the operator only trips one control handle, the cam which trips actuator of valve Q can be designed to make contact a predetermined number of times then miss one time. On the time that it misses, the piston of the work cylinder will return to its starting position and stop. When the work cylinder piston advances to start the next cycle the cam will reset automatically.

In Fig. 7 we use the starter valve W so it is necessary

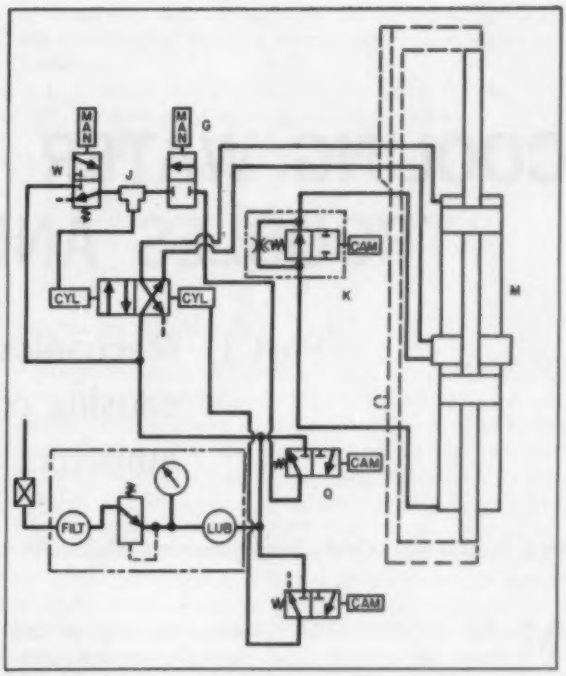


Fig. 7. Pressure type controls are used in this circuit to obtain reciprocating action without using electrical solenoids.

to add shuttle valve J to the circuit in order to keep the pressure entering valve W from exhausting through valve Q and vice versa. Shuttle valves are compact and inexpensive. Valve G is the stop valve in the system. When closed it will only allow one complete cycle.

In applications requiring reciprocation of cylinder pistons these are some of the important things to remember. It is imperative that sufficient lubrication be present in the air lines otherwise one can expect considerable friction between the cylinder packings and the cylinder tube and piston rod. The efficiency of the cylinder will be greatly reduced and the packing life will be considerably shortened. There are instances where cylinders have failed completely in less than a week's operation due to lack of lubrication.

Keep air lines to the cylinders of sufficient size so as to not cause any restrictions. Many unsatisfactory pneumatic circuit performances can be traced to restricted piping. Design the piping to eliminate sharp bends, which may cause tubing to partially collapse. Eliminate low spots where water may collect.

Design or select brackets, cams, limit switches and other accessories that will withstand the constant impact of a reciprocating cycle. A failure in any of these small items will cause the circuit to malfunction. Make certain that a sufficient volume of air is available for the application. Too often it is found that the air supply is inadequate to properly do the job.

In working out some of the more complicated circuit requirements where automatic cycling is desired, it will be found that it will be less difficult if electrical controls are used especially if compactness in the system is a desirable feature. In future articles we will show some of the automated applications and show how the electrically actuated controls are used. **End, Part V**

COOLING WATER TROUBLES AND TREATMENT

Part 1. Mechanics of electro-chemical action causing corrosion and effects of various inhibitors are discussed in this installment

By J. S. BEECHER, Chief Chemist, Power Chemicals Div., E. F. Drew & Co., New York City

MANY INDUSTRIAL plants requiring cooling water for one or more purposes are not fortunate enough, because of their location, to have available an unlimited supply of water of the desired quality at a sufficiently low temperature to fulfill their cooling needs. Many, who years ago had an abundant supply of this most important material and did not anticipate that the time would come when the supply would be inadequate, now find themselves in a position where crash programs must be scheduled to meet cooling water requirements.

Users of once-through cooling water can conserve water by replacing once-through systems with open circulating cooling water systems. In an open circulating cooling water system, a small portion of the circulating water is evaporated to effect most of the cooling that occurs. Some cooling is effected by convection when air countercurrently contacts water, and then leaves the tower or pond. The main body of circulating water supplies the required amount of heat to evaporate the small portion of circulating water. Approximately 1000 Btu are extracted from the main body of circulating water for every pound of water evaporated. This condition lowers the temperature of the main body of water.

For each 10 F drop in temperature of circulating water passing through a cooling tower or sprayed in a pond, 7.5 F to almost the entire 10 F may be due to heat carried away by convection by air. Generally, the assumption is made that a 1 per cent evaporation loss, based on the rate of circulation of cooling water occurs for each 10 F temperature drop of circulating water passing through a tower.

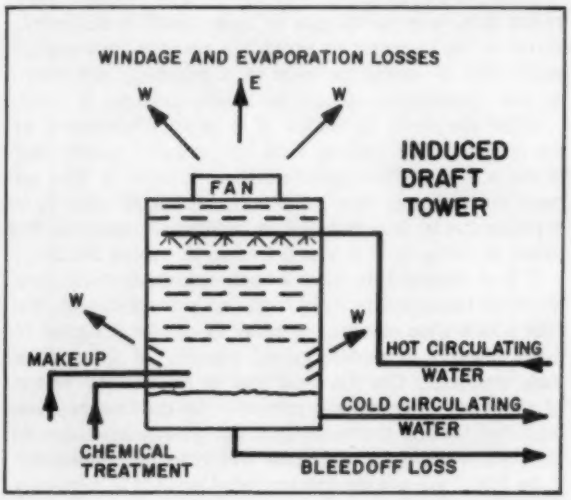
When water falls down through a cooling tower and air passes up through it, or when water is sprayed into the air as in a spray pond, a certain amount of water is carried away by the air or it just drifts away. This loss generally is called a windage or drift loss and ranges from 0.1 to 0.2 per cent for mechanical draft cooling towers, from 0.3 to 1.0 per cent for natural draft or atmospheric towers, and from 1.0 to 5.0 per cent for spray ponds. All losses are based on the rate of the circulation of cooling water.

The evaporation loss causes the solids in the circulating water to concentrate. The windage or drift loss has the effect of bleeding circulating water from the system. Both losses are replaced by fresh makeup water. It is obvious, therefore, that the effect of the evaporation loss is to concentrate the circulating water while the effect of the windage or drift loss is to deconcentrate it.

A relationship between these losses exists and a study of this relationship reveals that the theoretical number of times that the makeup water will concentrate can be estimated. The relationship is: theoretical number of cycles that the makeup water will concentrate is equal to the per cent evaporation loss, plus per cent windage or drift loss, all divided by the per cent windage or drift loss.

A study of the characteristics of the makeup water

Fig. 1. Sketch of an induced draft tower shows losses.



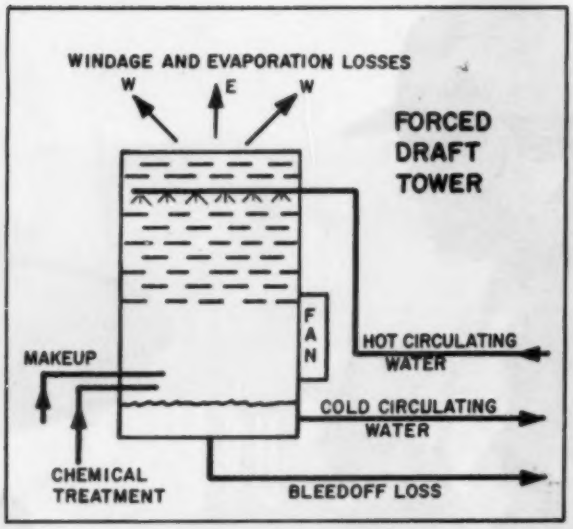


Fig. 2. Another approach to movement of cooling tower air.

indicates the limit that should be placed on the number of times that the makeup water should be permitted to concentrate. Cycles of concentration of the makeup water are limited by one or more of the following constituents: calcium hardness, bicarbonate alkalinity, silica, total solids, sulfate and chloride. The extent to which any of these impurities are allowed to concentrate depends on several factors, among which are: the problems that are to be prevented, operating conditions, and the type of chemical treatment used.

If it is found that the number of cycles that the makeup water will be permitted to concentrate are less than the number of cycles that the makeup water will theoretically undergo, then the windage or drift loss must be supplemented by intentional bleedoff of circulating water from the cooling water system. Bleedoff generally is taken from the basin of a tower or spray pond, or from a hot water return circulating line. A relationship exists between the evaporation loss, windage or drift loss, the intentional bleedoff loss and the number of cycles that the makeup water will be allowed to concentrate, and from this relationship the needed bleedoff can be determined.

All losses, as previously indicated, are expressed in percentages and are based on the rate of circulation of cooling water. The relationship is: per cent bleedoff is equal to the per cent evaporation loss, divided by the permissible number of cycles of concentration of the makeup water minus one, all minus the per cent windage or drift loss.

The purpose of bleeding circulating water from the system is to deconcentrate the circulating cooling water. The concentrated circulating cooling water bled from the cooling water system is replaced by fresh makeup water.

When the total losses, that is, the evaporation loss, windage or drift loss and bleedoff loss, are determined, the amount of fresh makeup water needed to replace these losses can be estimated by multiplying by the rate of circulation of cooling water the sum of all the losses expressed in percentages divided by 100.

Generally, one or more of the following problems are encountered in open circulating cooling water systems:

1. General and localized corrosion of metals.
2. Formation of deposits on metal surfaces.
3. Growths of algae and other type of microorganisms in towers or spray ponds or even in the systems.
4. Delignification of cooling tower lumber.
5. Chemical attack of cooling tower lumber.
6. Fungi attack of cooling tower lumber.

Corrosion of Metals

All metals have the tendency to revert to the original form in which they existed. For example, iron and copper tend to revert to the oxide form in which they were present in an ore. The intensity of this tendency depends on several factors, the most important of which are: the type of metal, the quality of the cooling water, the rate of circulation and the type of service involved.

Corrosion of metals has been adequately defined as an electro-chemical reaction. For corrosion of metals to occur, a difference in potential must exist between two or more points and current must flow. A difference in potential between points can be created for several reasons, among which are: imperfections in the metal surfaces, differences in the concentration of dissolved oxygen at one point as compared with another, the presence of deposits on metal surfaces, stresses in the metals, and the use of dissimilar metals.

When corrosion occurs, metals go into solution at anodic (positive) areas. One or more of several reactions occur at cathodic (negative) areas. Hydrogen ions are reduced to atomic hydrogen by taking on the available electrons. The atomic hydrogen plates out on metal surfaces at those areas. If this film of hydrogen gas is not destroyed, polarization will occur and the corrosion reaction will be halted. Unfortunately, this does not usually happen.

The film of hydrogen gas may be destroyed mechanically, or it may be removed chemically by reacting with dissolved oxygen to form water. Circulating cooling water is always saturated with dissolved oxygen since the water intimately contacts air as it passes through a tower or is sprayed in a pond. In addition to playing the role of a depolarizer by reacting with and removing hydrogen gas from the surface, dissolved oxygen may be reduced at cathodic areas by taking on electrons and reacting with water to form hydroxide ions. The hydroxide ions are free to react with ferrous ions or possibly other ions.

Other cathodic reactions that occur are the reduction of ferric iron to ferrous iron, and cupric ions to cuprous ions. No appreciable polarization occurs when these reactions occur.

The chloride ion has the effect of stimulating corrosion. Therefore, when the chloride ion concentration of a water is high, corrosion generally is more severe than when the chloride ion concentration is low. The above stated reactions result in a continuation of corrosion.

Over a period of time, anodic and cathodic areas may shift with the result that corrosion tends to be-

(Continued on page 152)

For more facts circle 564 on Reply Card

His customer needed cable fast—to cover a breakdown. It took a weekend of teamwork to handle the

Emergency at 5:05!

Friday, 5:05 P.M. The call caught me just as I was leaving the office. One of my customers* in Seattle was in trouble.

I'm Tony Mitrovich—District Sales Manager for Rome Cable in Seattle.

A big piece of equipment had broken down and my customer needed 500 feet of 5-KV cable *fast!* I wasted no time getting Long Distance. The answer lay some 2500 miles away—in Rome, N. Y.

Friday, 8:15 P.M. Rome time. I had the Sales Service Manager at Rome on the line. I caught him at home. As I got the story later, my request triggered a chain reaction of events. Here's how they went.

Friday, 8:30 P.M. The Sales Service Manager at Rome tried to contact the Head of the Shipping Department. No luck. He tried the Traffic Manager at home. He was out bowling in the Friday night league. Only one thing to do . . .

Friday, 9:30 P.M. He located his man at the bowling center; both went back to the plant that same night, located the right cable in stock and got it out.

Friday, 11:00 P.M. Order completed!

Saturday morning, 7:30 A.M. 500 feet of cable was taken to the airport, where it was shipped by air to Seattle.

Monday morning, 7:30 A.M. in Seattle. The necessary cable was on the job.

That's teamwork. That's the kind of support that makes my job a pleasure—and makes lots of friends for me.

And that's the kind of service that helps lots of my customers out of jams—makes them loyal Rome Cable customers.

**Name furnished on request*

ALCOA
ROME CABLE DIVISION

This story typifies the service you can rely on from your Rome Cable salesman. He links you directly and quickly with the facilities and engineering skills at Rome—not only during emergencies but also during any special demands of your job. When you have a wire and cable problem of any kind, give him a call.

ROME CABLE
DIVISION OF **ALCOA**

come general. If this does not happen, then corrosion will be localized (pitting type of corrosion).

In the case of brass, both copper and zinc may go into solution and then the copper may redeposit on the metal surface. Such a reaction results in the dezincification of brass.

Products of the corrosion reactions may react with each other or with constituents in the water to form almost completely insoluble compounds which can adhere to the metal surfaces. The film formed, which as indicated above may have other constituents besides corrosion products enmeshed in it, acts as a barrier between the metal surfaces and the corroding medium—cooling water. If the formation of the film can be properly controlled, corrosion can be controlled. Compounds formed as a result of the corrosion reaction may be transported to locations distant from where they formed. This is one reason why small lines frequently become plugged up.

Corrosion Correction

Before any treatment for conditioning circulating cooling water is selected, several factors must be considered. One of these factors is the quality of the makeup water.

Water containing excessive concentrations of calcium hardness, bicarbonate alkalinity, silica or iron may be unsuitable for use as makeup. Objectionable concentrations of impurities can be reduced to acceptable low levels by the use of such primary water treating equipment as a cold lime softener or a combination of equipment such as a cold lime softener followed by a zeolite softener. The selection of the equipment needed depends upon the quality of the water, and other factors such as operating conditions and the problems involved.

The chemical treatment selected to correct one problem encountered in an open circulation cooling water system may automatically correct one or more other problems. For example, lowering the pH value of cooling water by the addition of acid to prevent the formation of calcium carbonate deposits or to increase the effectiveness of a corrosion inhibitor may automatically increase the effectiveness of an algae control agent.

One method that has been used for controlling corrosion, but which, because of difficulties encountered in its control, has not been used to any great extent, is the maintenance of Langelier's Saturation Index at a value higher than +0.5 but less than +1.0. Langelier's Saturation Index is the difference between the actual pH value of a water and the saturation pH value. The saturation pH value is determined by studying the characteristics of the water.

A relation exists between the calcium hardness, bicarbonate alkalinity, dissolved solids, and temperature that established the saturation pH value. A positive Langelier's Saturation Index indicates that the water is oversaturated with respect to calcium carbonate and the tendency will be for it to deposit out a very thin protective film of calcium carbonate on metal surfaces.

If this film develops as planned, a barrier will be placed between the metal and the circulating cooling water and by means of this barrier, corrosion will be prevented. A negative Langelier's Saturation Index indicates that the water is undersaturated with respect to calcium carbonate, and the tendency will be for the water to dissolve it. Thus, the water is corrosive.

Inadequate control of the pH value of the water by the addition of an acid or an alkali can result in the water being too deposit-forming at one time and too corrosive at another time, or possibly even too corrosive in equipment where the cooling water enters and too deposit-forming in the same equipment where the cooling water leaves.

The use of corrosion inhibitors for preventing corrosion of metals in an open circulating cooling water system is a widely accepted procedure today. When a corrosion inhibitor is added to water, the objective is to treat the metals in the system, not the water.

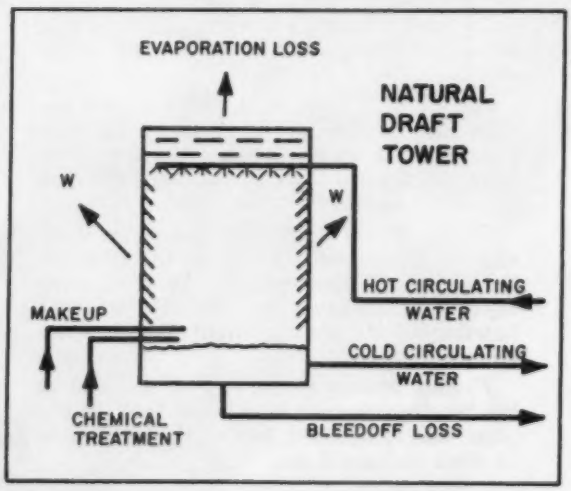
In a previous section, the corrosion reaction was defined as an electro-chemical reaction, and it was pointed out that for the corrosion reaction to proceed, a difference in potential had to exist between an anodic (corroded) area and a cathodic (non-corroded area), and that current had to flow. The corrosion reaction may be stifled by using inhibitors that do their work at anodic or cathodic areas.

When an anodic corrosion inhibitor is used, a sufficent amount of the inhibitor must be used to prevent corrosion. If a sufficient amount of the inhibitor is not used, there likely will be points on the metal surfaces vulnerable to corrosion. If the velocity of the corrosion reaction is controlled exclusively by the anodic reaction, this may not be dangerous. This is because the anodic corrosion is reduced in proportion to the decrease in vulnerable anodic areas. Hence, the intensity of corrosion (attack per unit area) does not change.

If the velocity of the corrosion reaction is controlled, even in part, by the cathodic reaction, the intensity of the attack will be increased. Because it is unlikely that the corrosion reaction will be controlled exclusively by the anodic reaction, anodic inhibitors generally are considered to be potentially dangerous. Hence, they must be properly used to obtain the desired protection. The use of an insufficient amount of inhibitor can result in severe localized corrosion.

Cathodic corrosion inhibitors control the cathodic

Fig. 3. In atmospheric tower natural draft is used.



reaction and, by this control, decrease the total corrosion rate. The anodic areas subject to attack are not reduced. Therefore, because of the reduction in the total corrosion rate and the fact that the anodic areas have not been reduced, the intensity of corrosion is reduced.

Hence, because with the use of cathodic inhibitors, corrosion is over-all or general on the metal surfaces and is not localized, cathodic inhibitors are classified as safe inhibitors. However, in general, they are not considered as efficient inhibitors as the potentially dangerous anodic inhibitors.

Factors which affect the selection of a corrosion inhibitor, or combination of inhibitors are: 1. The degree of inhibitor needed. 2. Cost. 3. Effect in waste disposal systems. 4. Toxicity. 5. Handling. 6. Feeding requirements. 7. Necessary testing and control.

Chromates

Chromates function primarily as anodic inhibitors. The reaction that occurs at anodic areas on iron surfaces results in the formation of a mixture of hydrated ferric and chromic oxides which form a film over anodic areas and, thereby, stifle the corrosion reaction. The concentration of chromates needed to inhibit corrosion generally is higher than 100 ppm, expressed as sodium chromate, when the inhibitor is used alone, and less than 100 ppm when used in combination with other inhibitors. When a high concentration of chromate is maintained in a cooling water system, the pH value of the cooling water is kept in the range 7.2 to 8.5, the actual working range depending upon the service conditions and whether or not scale formation or delignification of cooling tower lumber are problems.

When chromates are used in combination with other inhibitors, such as polyphosphates, which are anodic inhibitors, and zinc salts, which are believed to act cathodically, the concentration of chromate is generally maintained less than 100 ppm, sometimes as low as 10 ppm. The pH value of the cooling water is kept in the range 6.0 to 7.0, usually in the range 6.0 to 6.5. The polyphosphates, which act with the chromates, are held in the range 5 to 40 ppm, usually 10 to 25 ppm. The concentration of the zinc ion is maintained in the range of a fraction of a part per million to as high as 20 ppm, usually in the lower end of the range.

Polyphosphates

Polyphosphates, like chromates, are classified as anodic inhibitors. The reaction that occurs at anodic areas results in the formation of an iron oxide-phosphate film. The film may be more complex than indicated due to the fact that small amounts of other constituents such as calcium carbonate may be mixed in with it. Be as it may, the primary composition of the film is iron oxide. The concentration of polyphosphate needed to inhibit corrosion ranges between 10 to 40 ppm, usually 10 to 20 ppm.

The polyphosphates function best as corrosion inhibitors when the pH value is kept in the range 6.0 to 7.0, usually near 6.5. Overtreatment with polyphosphate or the maintenance of too high a pH value possibly can result in the formation of objectionable amounts of phosphate and possibly other types of deposits on metal surfaces. The corrosion inhibiting action of polyphosphates is increased when certain other inhibitors, such as chromates, zinc salts, tannin, lignin, and other organics are added.

Silicates and Nitrites

Silicates function as anodic inhibitors. The reaction that occurs at anodic areas results in the formation of an iron oxide-silicate film. The concentration of a silicate, expressed as SiO_2, needed to inhibit corrosion ranges from 8 to 40 ppm, usually 15 to 25 ppm above the silica concentration already naturally present in the cooling water. Silicates function best as corrosion inhibitors when the pH value of the cooling water is kept in the range 6.0 to 7.5, usually near 6.5. The maintenance of too high a pH value—over 8.0—or too high a silica concentration—over 100 ppm—may result in the precipitation of undesirable silicate compounds on metal surfaces.

The presence of high magnesium hardness—over 250 ppm expressed as calcium carbonate—is undesirable since not only may it result in the precipitation of a silicate compound, but also it may possibly act on the already formed protective film and alter its structure resulting in destruction of its protective properties. The corrosion inhibiting action of silicates is increased when chromates and polyphosphates are added.

Nitrites function as anodic inhibitors. The reaction that occurs at anodic areas results in the formation of an iron oxide film. When used alone, high concentrations of nitrites are needed to inhibit corrosion—500 to 1000 ppm expressed as sodium nitrite—usually near 1000 ppm. Nitrites function best as corrosion inhibitors when the pH value is kept in the range 7.0 to 8.0, usually near 7.5. Below a pH value of 6.5, nitrites may decompose with the result that serious localized corrosion may occur. Lower concentrations of nitrites, 300 to 500 ppm may be used for corrosion control when polyphosphates and zinc salts are added in small concentrations.

Complex organic compounds, the most common being nitrogen or sulfur-bearing compounds, have found application as corrosion inhibitors. It is believed that the organic ions attach themselves to cathodic areas on the metal surfaces and prevent hydrogen from being evolved. Hence, in effect, the action causes cathodic polarization. **End Part I**

Derivations of Formulas

The author has supplied us with derivations of formulas pertaining to makeup water. The formulas can be used for the determination of bleedoff for the limitation of cycles of makeup water concentration and also for arriving at the theoretical number of cycles of concentration when no bleedoff occurs. If you would like to obtain complimentary copies of the derivations, write to: The Editor, Plant Engineering, 308 E. James St., Barrington, Illinois. Please ask for "Concentration Formulas Derivations."

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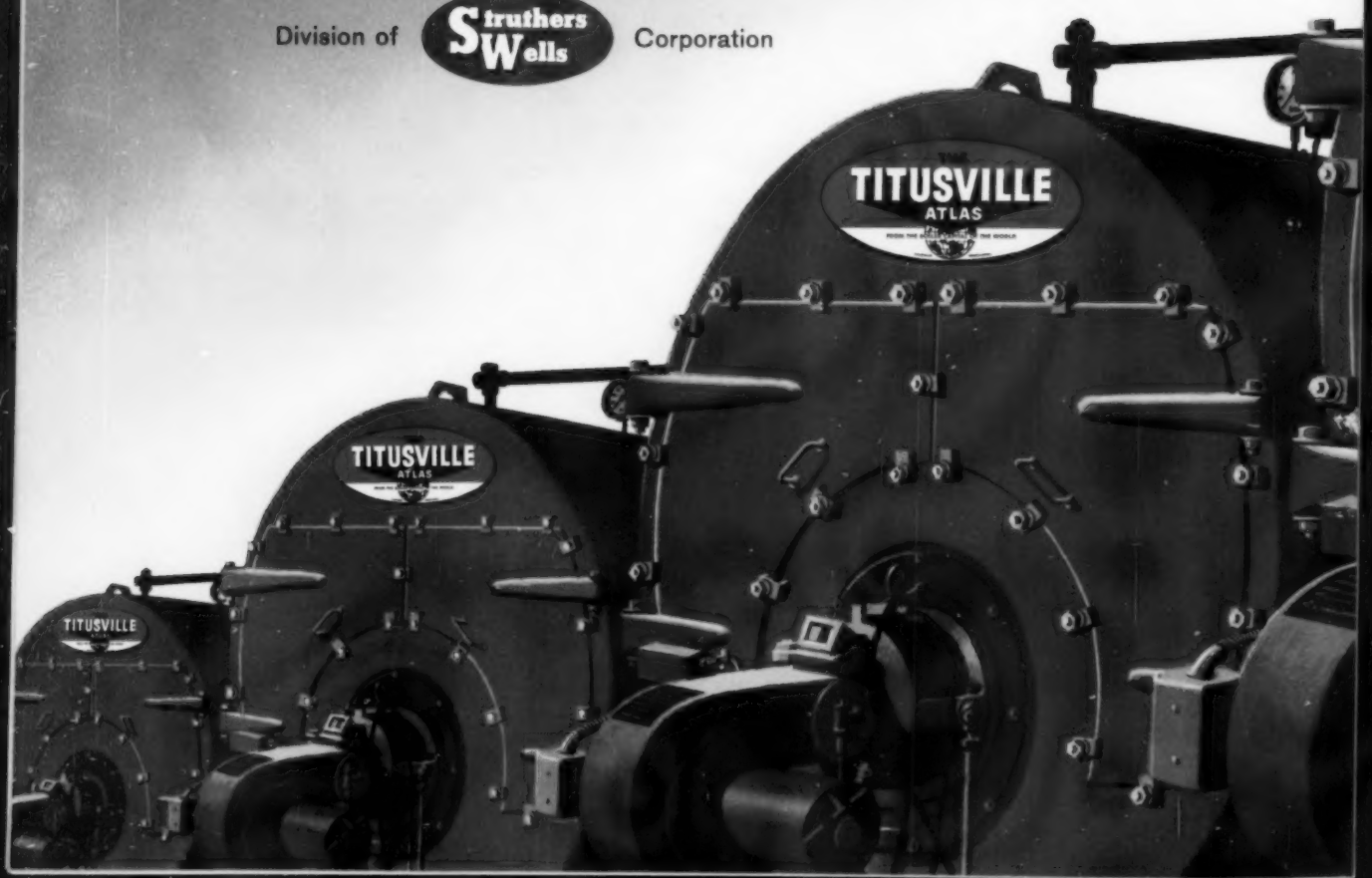

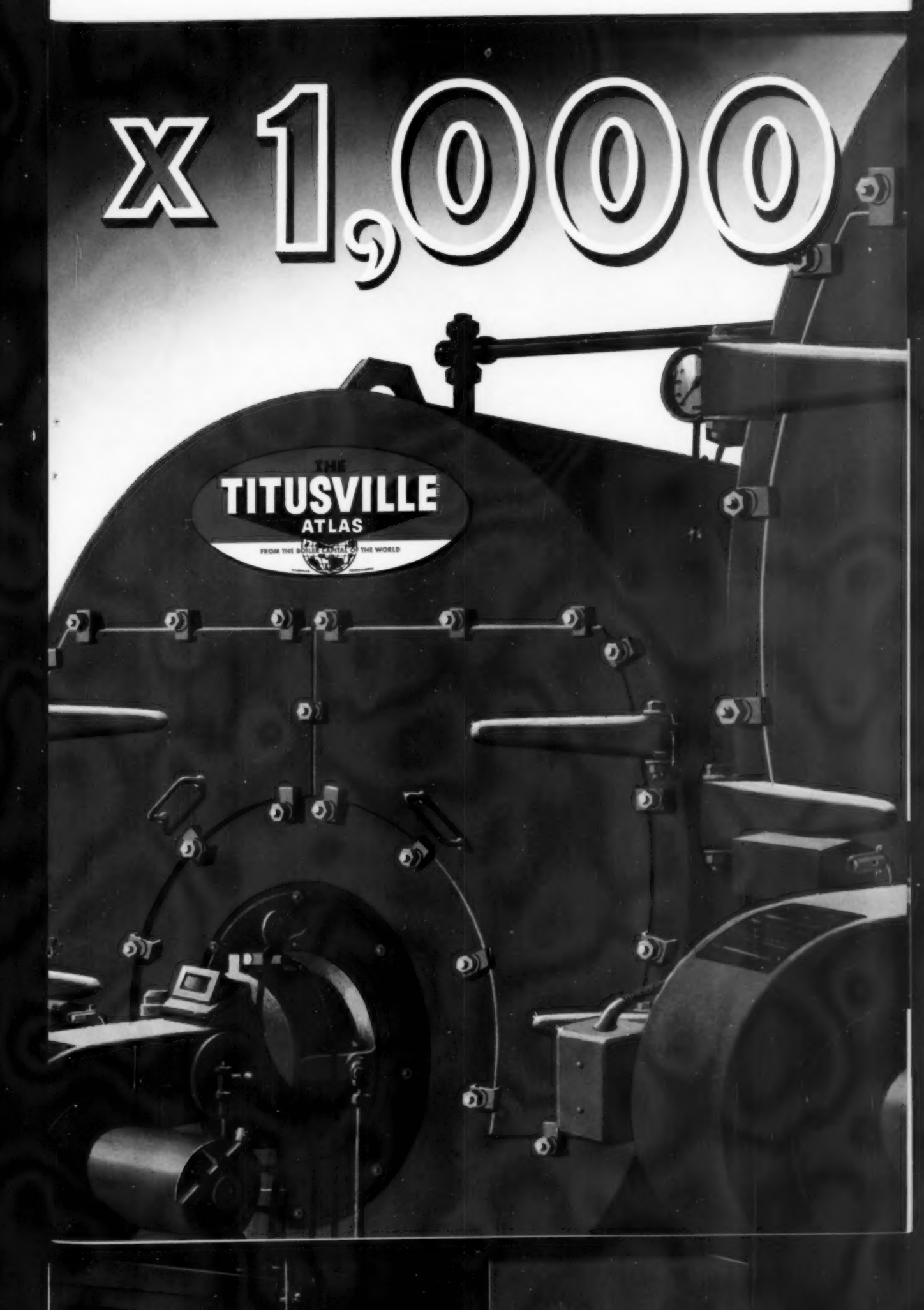
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THE
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ATLAS

SIMPLIFY MAINTENANCE— REMOVE OBSTACLES

By F. JOHN EGGERT, Mechanical Engineer, Hamburg, N. Y.

IT HAPPENS every so often. Physical interference goes unrecognized as a controlling factor in maintenance. Too often it is permitted to establish the accepted sequence of routine maintenance operations.

A second look at any operational sequence might reveal that the physical interference can be eliminated. When the interference is eliminated, the amount of work is reduced.

In this example, it was periodically necessary to replace the drive motors of diesel-electric locomotives. The shop routine operation required the removal of the entire locomotive chassis from the trucks to permit removal of drive motors.

A lot of unnecessary work was required to service this equipment. Nevertheless it had been done for years—and without question. It was shop practice because no facilities were provided to do it otherwise.

Whether or not your maintenance operations include replacement of locomotive drive motors is not the point. This is merely an illustration of the fact that physical interference can establish the sequence of maintenance operations.

In this example, the physical interference consisted of the concrete walls of the repair pit. The solution consisted of making a section of the repair pit wall removable Fig. 1.

With the interference removed, the operational sequence no longer required raising the chassis from the trucks. The drive motors are now removable from the side of the repair pit as is shown in Fig. 2.

Here is a brief description of how the rail and beam section is removed: The hydraulic jack raises a corner of the truck about two inches so that the wheel flange clears the rail. Then the swivel cart is moved into position. The (four) ¾ in. bolts holding the beam to the beam seats are removed and the two sliding lock bolts (one inch hooked rods) are moved back horizontally. The beam assembly is then carted out.

The opening in the wall also provides an additional entrance and exit from underneath rather than walking all the way to the end of the locomotive and up the steps.

After the work is completed, the beam and rail assembly are replaced. The sliding bolts are moved into locked position, the ¾ in. bolts and nuts reinstalled, and the jack mechanism is lowered and removed.

Not only did this reduce the amount of indirect man-hours of work, but it also reduced the amount of overhead electric crane service required. In addition, less floor space was required for disassembly.

No doubt there are many similar maintenance operations being governed by unrecognized physical interferences in many plants. Perhaps adaptation of a similar modification to make such interfering structures movable will simplify one of your maintenance operations. **End**

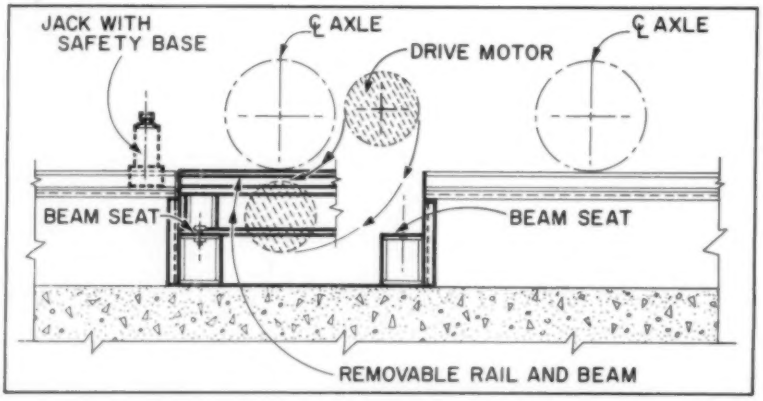

Fig. 1. Elevated view shows wheels of diesel-electric locomotive and the drive motor which has to be pulled out for servicing. Note removable section.

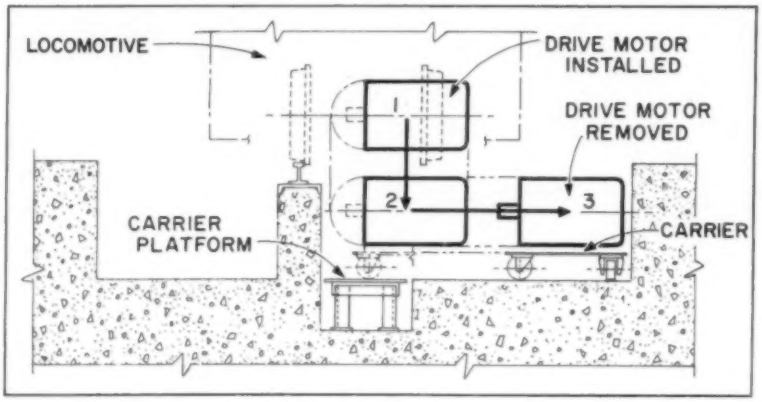

Fig. 2. After the locomotive is moved over the pit area, wall section is removed, simplifying job of taking out old drive motor and putting in new one.

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3 WAYS SAFER FOR PEOPLE AND PROPERTY

HERE'S THE FIRST DEAD-FRONT plug-in duct. Butyl insulation covers the full length of each silvered aluminum bus bar, *even in bus plug openings*. You get positive protection for personnel against accidental contact with "live" bars.

PLUG-IN SAFETY DOOR IS ALWAYS CLOSED during installation of XL Safety Plug. Interlock finger positively prevents plug installation or removal when Safety Door is open . . . and it keeps door from closing against "live" plug fingers.

THERE'S NO ARCING to endanger people or property . . . you can't plug in or unplug when the switch is "ON."

New XL BUStribution® Duct cuts down installation time . . . takes less space . . . reduces duct weight on building structure as much as 40%. Keyed bus ends slip together in a hurry while a single integral bolt locks joints securely under a ton of pressure.

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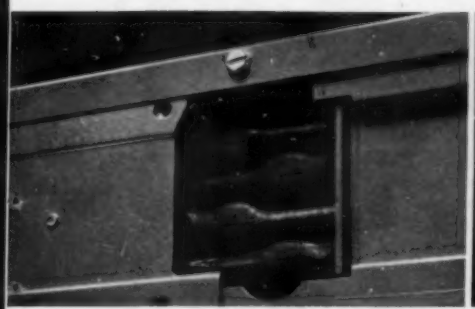

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Triple Zone, Double Deck Oven Cures and Cools Plastics

DESIGN OF A SYSTEM of handling spongy, plastic materials in 75-ft-long sections, supplying an even, controlled curing heat, plus rapid cooling has been completed by engineers of the Industrial Equipment Division of R. C. Mahon Co.

Embodied in a unique 80-ft, double deck oven, it enables Goodyear Tire & Rubber Co. to handle material coming from a so-called "making" machine through curing in a continuous process.

The oven is arranged to handle, and hold for eight hours or longer in curing, two seven-ft-wide sections of the material at pre-determined temperatures up to 300 F. The oven processes the material directly from the making machine, cools it prior to discharging, then automatically comes up to heat again to handle the next load.

Success of the oven is attributed to the double deck arrangement of the individually-driven chain conveyors, the provision of three separate heating zones, and system of recirculating and exhausting required air for the final cure.

Steam is supplied through fin-type coils for heat. The coils are located in insulated enclosures on top of the oven, along with distributing fans to circulate the air about the material traveling through the oven.

In operation, as the plastic material emerges from the making machine, it is attached to the threading bar of the first-deck conveyor and carried into the oven at the rate of 40 feet per minute. When 75 feet of it is fed in, the material is cut and another 75 feet is fed into the second deck of the unit.

The over is then slowly brought up to heat automatically for the cure period. During curing, air is recirculated in each of the three heating zones at a volume of about 5750 cfm. This is a total volume of 17,000 cfm, including a small amount of fresh air, which is fed into each of the zones to satisfy the dampered exhaust from one of the exhaust fans.

Rapid cooling at the end of the cure is provided by opening the damper on the running exhaust fan, starting a second fan, then opening the fresh air dampers of the three zones and closing the recirculating air dampers.

The sequence enables temperatures of the curing oven to be dropped to below 200 F, before feeding in the next load of material.

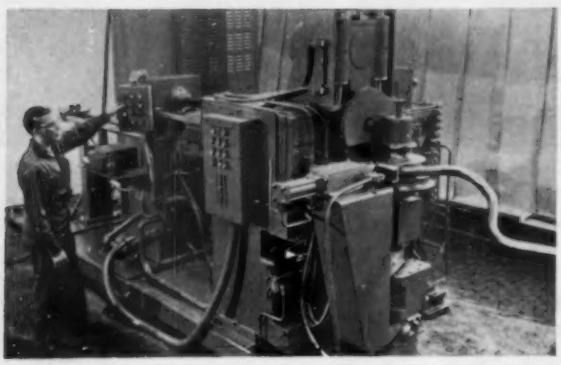
Tape-Controlled Bender Makes Tailpipes To Fit 'em All

AN AUTOMATIC automobile tailpipe bender that runs by the numbers is now available from the Nu-Era Corporation, Rochester, Mich.

Presently, tailpipe manufacturing requires a series of single bends in straight tubing. The pipe is transferred to a number of single-function machines, each performing an independent bend, during production. Some complex models undergo a dozen or more manufacturing steps using current production methods and equipment.

General Machinery Division of Baldwin-Lima-Hamilton Corporation developed the new machine for Nu-Era and General Electric Company's Specialty Control Department, Waynesboro, Va., designed and built the special electronic control system that automates the Bend-O-Matic.

To handle the complex job of bending straight tubing into tailpipes to fit virtually any automobile or truck, General Electric adapted its precise, point-to-point numerical positioning control. This is the first application of the control system to a metal-forming process.



Heart of the system is a small—one inch in width, generally about 18 in. in length—programmed paper tape which feeds through an integral tape reader to direct automatic operation of the machine. Three motions and 13 auxiliary functions can be programmed.

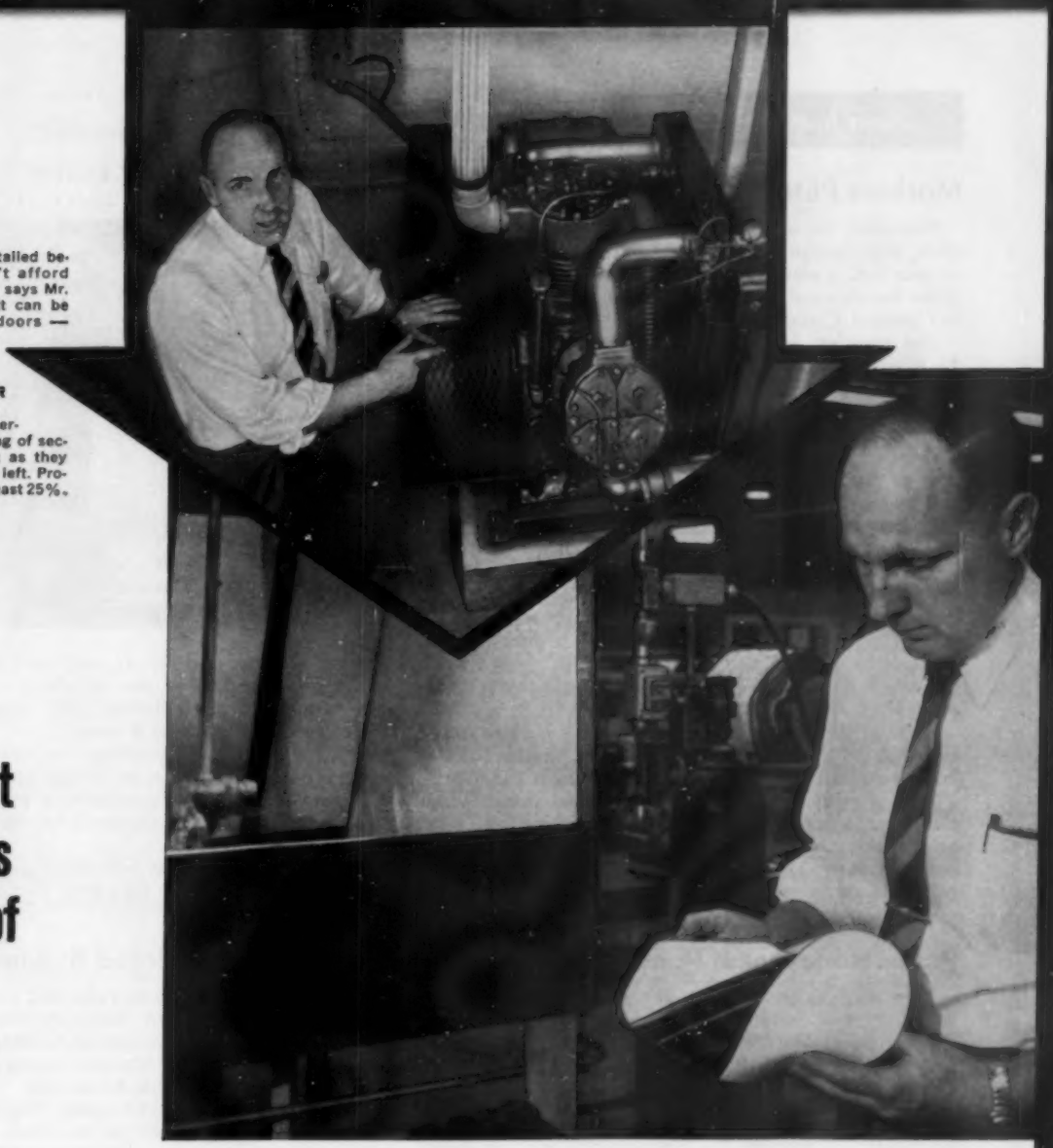
Operation of the machine is completely automatic except for loading and unloading. To run a tailpipe, an operator selects the proper tape, inserts it into the tape reader, selects the proper diameter of straight tubing, places it into the machine, presses a button, and removes the bent-to-order tailpipe after the machine has completed production.

Actual operating time amounts to about two minutes, with the machine making precise bends at a rate of six per minute. General Electric engineers expect that performance can be boosted slightly—to about 6½ bends per minute—on future models.

Controlled motions include carriage feed, polar rotation of the pipe, and the bend angle.

The three chief functions of the machine are to move, position, and bend pipe; move, position, and flatten pipe; and move, position, and cut off pipe.

In order to reduce stocking problems, 16-ft lengths of straight tubing are generally used—although the Bend-O-Matic will accept tubing up to 36 ft in length. Since each tailpipe is eight feet or less in length, this means that two pipes can be made from each length of tubing. The automatic cutoff operation is programmed to saw the pipe in half following completion of bending and flattening operations.



LE ROI 50S2 was installed because Bowes couldn't afford compressor downtime, says Mr. LaFara. Air-cooled unit can be used indoors or outdoors — needs no plumbing.

FINISHED TIRE REPAIR SECTION is inspected. Compressed air now permits automatic spraying of sections with liquid latex as they pass through booth at left. Production increased at least 25%.

This plant minimizes the risk of "no air - no work" with a

LE ROI 50HP STATIONARY COMPRESSOR

A dependable compressor headed the list of critical needs when Bowes Seal Fast Corp., of Indianapolis, Ind., merged two plants under one roof. A Le Roi 50S2 two-stage compressor provides this vital dependability . . . and all the compressed air needed to produce over 2000 various items for the upkeep of cars, tires, and tubes.

James S. LaFara, Plant Manager, reports that the Le Roi unit delivers 210 cfm at 125 psi . . . operates 75% to 80% of 8- to 16-hour production days, five days a week, and supplies almost 100% of all the compressed air needed. Down-time, he adds, is at a minimum, and maintenance costs are below those of two smaller compressors which the Le Roi replaced, and which now serve only as standby units.

Look what this Le Roi 50S2 does! It provides air to spray tire-repair sections (boots) and tubeless-tire repair plugs with a mixture of liquid soap and water. The unit powers latex spraying machines, and blows scraps from tube-patch cutting machines. Other uses include air for lead moulding equipment, nut-driving units, cleaning vents on chemical filling machines, and for the plant's fire-protection system.

Are you looking for a "dependable" compressor? Check the complete line of Westinghouse unit-type and Le Roi stationary air compressors — from ½ to 100 hp. Contact your Le Roi distributor, or write to Le Roi Division, Westinghouse Air Brake Co., Milwaukee 1, Wisconsin.

SC-09

LE ROI STATIONARY COMPRESSORS

PORTABLE AND TRACTAIR® AIR COMPRESSORS • STATIONARY AIR COMPRESSORS • AIR TOOLS

For more facts circle 566 on Reply Card

Machine Puts 30 Million Pounds of Pull on Aluminum Plate

DESIGNED TO GRIP the ends of a 60-ft-long plate of thick, high-strength aluminum and stretch it by as much as four feet, a plate stretcher has been put into operation at the Ravenswood, W. Va. works of the Kaiser Aluminum & Chemical Corporation.

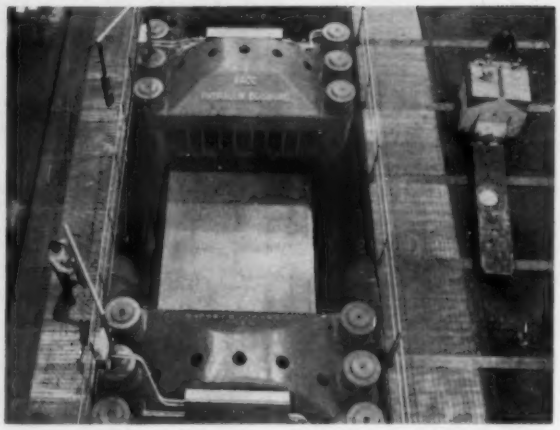
The stretcher, installed in a concrete pit 120 ft long, 32 ft wide and 15 ft deep, possesses a pulling force of 30 million pounds, or nearly twice that of the largest stretcher currently in the metals industry. It can handle aluminum alloy plate up to six inches in thickness and 13-1/3 ft wide, within an over-all cross-sectional area limit of 640 sq in.

Purpose of the stretcher is to refine the internal structure of the metal by equalizing stress distribution in heat-treated alloys and welding alloys.

The machine is supported on tracks, without a guiding frame, and no effort is made to hold it in a rigidly fixed alignment. Individual heads are supported on each side by eight railway-type car wheels on a double track. Innovations incorporated in the hydraulic system keep the two sides of the machine parallel, completely independent of the load in the jaws.

Some of the stretcher components are of massive size—each half of a head, made of cast steel, weighs 264,000 lb, and each of the two solid columns weighs 145,000 lb.

The gripping heads, of unconventional design, each consist of a top and bottom head, weighing 132 tons, held together by six forged tie bolts, 15 in. in diameter and 15 ft long. The stretching force is provided by 6000-psi hydraulic pressure on two 56-in. diameter cylinders,



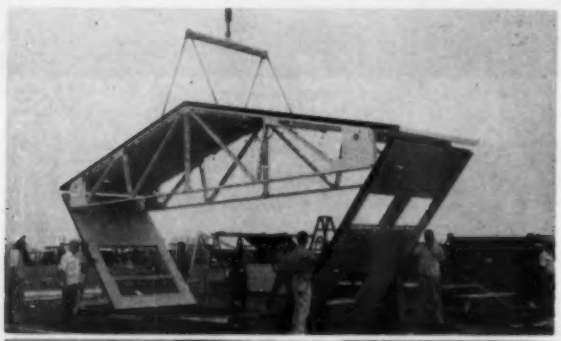
designed for 4½ ft of stroke, and used only during the high-pressure portion of the stretching cycle, remaining idle during the manipulating cycle when loading and unloading of the machine is done.

The columns of the stretcher are arranged to be adjustable to a minimum work length of 17 ft and to a maximum of 60 ft. The manipulating cylinder creates all forces required to adjust the heads for the various lengths of plate being stretched.

The plate stretcher was built for Kaiser Aluminum by Hydraulic G.M.B.H. of Duisburg, Germany.

Paper Honeycomb Panels Fabricated Into Lightweight, Insulated Building

TWO ALL-WEATHER, fast-assembly buildings of a unique design utilizing air-filled "weather-stripping" in all roof and wall panel joints have been erected at the White Sands Missile Range to house Nike radar and power equipment.



Manufactured for Army Ordnance, these prefabricated missile ground support equipment buildings can be completely assembled in less than five hours, and are equally suitable for tropical heat or Arctic cold.

The Douglas Aircraft Company designed, engineered and fabricated these prototype structures, under contract from and according to specifications of Western Electric Co. and Bell Telephone Labs.

To provide for speedy assembly, utility in all climates and airborne and ground mobility, engineers selected a design calling for aluminum-faced Aircomb panels with a pneumatic tubing seal. Aircomb is a lightweight, high-strength structural paper honeycomb manufactured by Douglas.

Mortised edges of the panels are lined with pneumatic tubing, which is inflated to about four pounds air pressure during the assembly operation. The inflated tubing tightly fills any apertures between the panels, insulating the interior from heat, cold, moisture and dust.

Transportation of the 110 panels and other elements required for the two structures (an air-conditioned, pressurized 2048-sq ft radar equipment building and an 840-sq ft generator building) has been accomplished on eight 25-ft trailers.

Electrical wiring and air lines for pressuring the tubing between the panels are pre-installed in the trusses. As each section of panel is placed during assembly, the electrical and air systems are plugged into those of the adjoining section. As the building grows, the lights are progressively turned on and the tubing seals between the panels inflated.

For more facts circle 566 on Reply Card

Steam trap dependability is a matter of what the manufacturer puts into the trap

ARMSTRONG TRAPS ARE DESIGNED AND MADE TO GIVE YOU DEPENDABILITY

1. Efficient, proved operating principle

Armstrong Traps provide the most advanced development of the time-proven inverted bucket principle. Simple, but effective, there isn't much that can go wrong.

2. Good design

Armstrong Trap design gives big capacity in a small package. The mechanism is virtually fool-proof. All body styles are easy to inspect and maintain without removal from the line.

3. Highest quality materials of construction

Only the best goes into Armstrong Traps. Bodies are close grained 30,000 tensile iron castings or high quality forgings. Working parts are all tough, corrosion resistant stainless steel.

4. Good workmanship

Armstrong Traps are made by craftsmen who take pride in their work. Careful inspection and frequent checking insure the quality of the trap.

5. Application know-how

Your problem has probably been solved already in the extensive experience of the Armstrong engineering and sales organization. You can be sure of sound, dependable recommendations.

Your local Armstrong Representative can show you what Armstrong dependability can do for you. Call him today or write direct.

860 Series for low pressure heating service.

800 Series, side inlet, side outlet.

No. 801, side inlet, bottom outlet.

880 Series, integral strainer.

200 Series, bottom inlet, top outlet.

Forged Steel Series for high pressures, high temperatures.

The 48 page Armstrong Steam Trap Book tells how to correctly size, install and maintain steam traps for any pressure, any temperature, any load plus full catalog data on Armstrong Steam Traps. Ask for Catalog K.

ARMSTRONG MACHINE WORKS

9127 Maple Street Three Rivers, Michigan

See Our Catalog in Sweet's Plant Engineering File

For more facts circle 567 on Reply Card

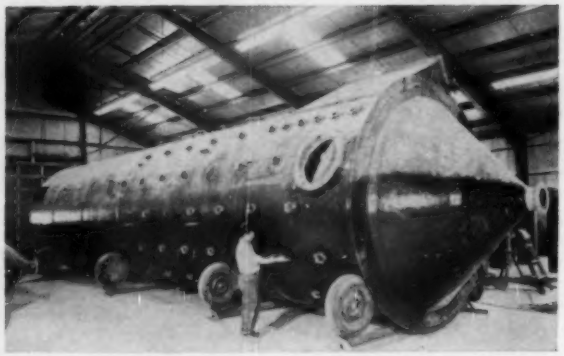
Scrubber for Corrosive Fumes Fabricated of Reinforced Plastic

FORTY-SEVEN FEET HIGH and 10 ft in diameter, a fume scrubber has been constructed of reinforced plastic by Buffalo Forge Company's Air Cleaning Division. Designed and engineered for a metallurgical processing company, the unit can effectively handle 42,000 cfm of dust-laden gases.

Both construction and size of the scrubber are unique; in construction, the only metal used is in the supports and external fasteners, while in size, the unit is reported to be the largest single piece of industrial equipment ever fabricated from reinforced plastic.

Faced with severely corrosive gas streams, containing mists and dusts of fluoride compounds. Buffalo Forge designers selected Hetron resin as the plastic base. This chemical-and fire-resistant polyester plastic, a product of Durez Plastics Div., Hooker Chemical Corp., was used with glass fiber reinforcing to construct the scrubber.

The main shell of the unit was fabricated by DuVerre, Inc. This firm is also constructing a second unit, 24 ft high and 5 ft in diameter, to be installed to control gases of magnesium oxide and fluoride compounds at a rate of 10,000 cfm.



High-Voltage Experimental Power Line Will Hang on Aluminum

FIRST SHIPMENT of aluminum members for a structure to serve the world's highest-voltage electric power line has been made by Aluminum Company of America. When assembled, they will form the world's largest aluminum substation. The components will comprise the North Substation of the pioneering Project EHV (Extra High Voltage) power line.

Now being constructed in western Massachusetts, the line will carry higher voltages than ever before transmitted. It will be used to acquire technical information necessary to help the electrical industry supply America's future power needs.

The substation will be flanked by two portal-type aluminum tower structures—forming an inverted U. Incoming utility power lines will reach a 42-ft-wide tower. Starting point of the experimental transmission line is a mammoth aluminum structure, comprising 68-ft-high vertical members supporting a 123-ft span.

The two towers, and the columns and structures within the substation between, are lattice-type assemblies of aluminum structural angles joined with aluminum bolts. Almost all of the components in the substation, including brace rods, turnbuckles, posts, rails, and gates, are of aluminum. Protecting the station is an 1180-ft enclosure of aluminum chain link fencing.

Adjustable Forms Speed Construction of Prestressed Concrete Beams

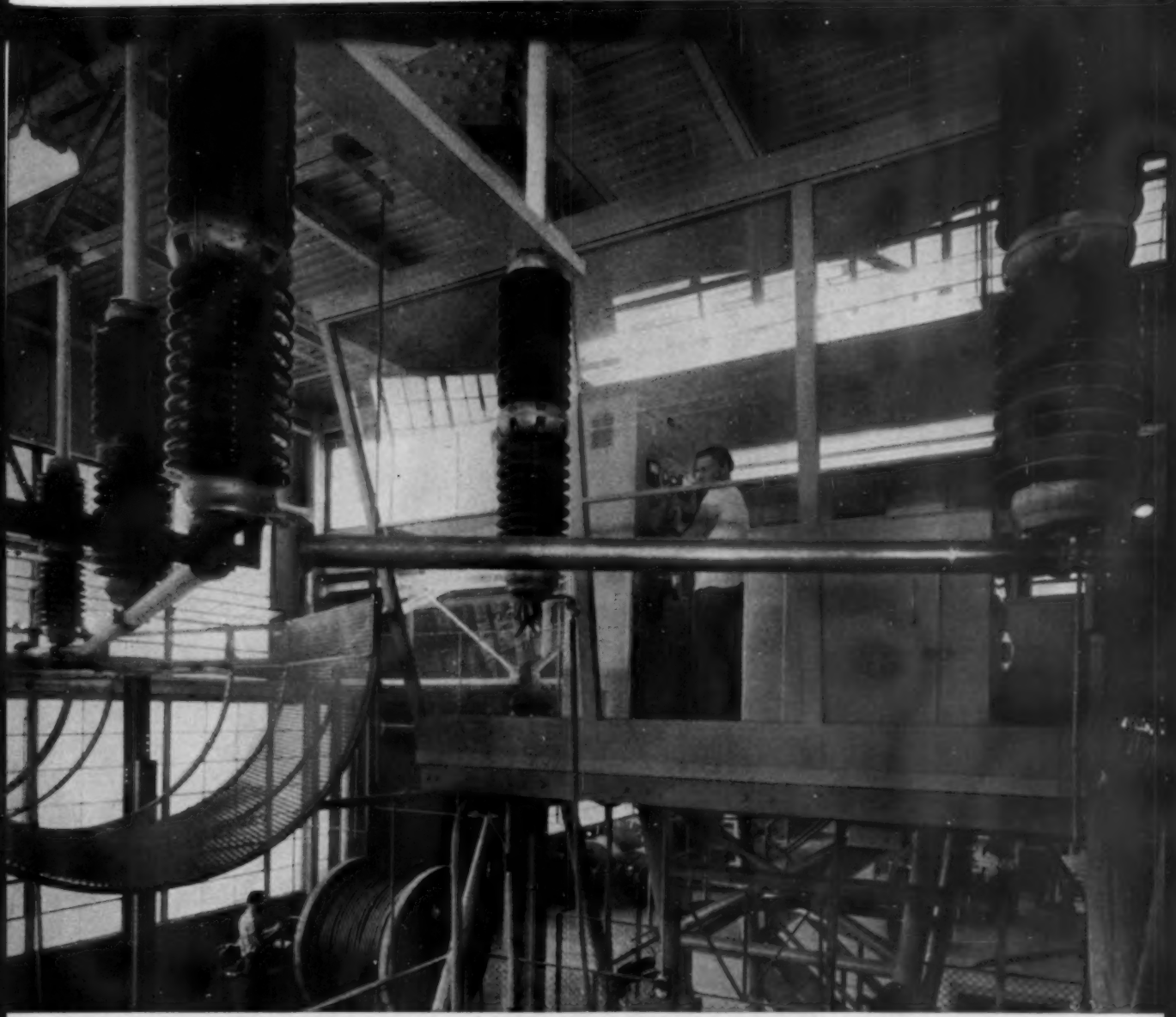
AT THE Lafayette, Indiana plant of American-Marietta Co., production of prestressed concrete beams is carried out in four 230-ft-long prestressing beds—one of which uses adjustable 10-ft section steel forms.

One side of the forms is hinged, and positioned and fastened vertically with connecting pins; or at an angle, for beam removal, on flexible legs.

They are used on one side of a double pretensioning bed, rated at 36 million inch-pounds of tensioning force capacity. The bed handles 1½ million pounds of stress, two feet above the soffit plate.

Box beams, precast in the steel forms designed and made by Blaw-Knox Co., contain reinforcing bars, and from 29 to 50 strands of ⅜-in. diameter high-tensile, stress-relieved cable. These cable strands are individually tensioned with a 15-ton hydraulic jack.

The forms are usually in cast position for 18 hours, although the hinged section could be removed in 4 or 5 hours. Tarpaulins cover the concrete during the steam curing period. A crane moves the beam from the bed, excess prestress cable is burned off, exposed cable end areas are coated to prevent moisture entering the beam.



Shown here is a section of final testing area. Voltage tests are being applied to *full reel lengths* of cable before shipment.

ANOTHER BIG REASON WHY YOU SHOULD CONSIDER ANACONDA BUTYL (AB) CABLE—

SPECIALIZED QUALITY CONTROL AND INSPECTION

From the start: Raw-material suppliers are required to submit certified test reports. Then, tests and sampling at our plant offer extra protection even before production begins. **To finish:** Here's the final inspection line where the finishing touches are applied and where every inch of cable is carefully inspected. Perhaps you already know that Anaconda test procedures are much above industry standards. But do you know that test voltages on Anaconda Butyl (AB) Cable are 125% of industry standards—that minimum corona level is 150% of rated voltage to ground?

Quality control at Anaconda is *more* than mere testing and inspection. It is built into every manufacturing step. That's why you can be sure your Anaconda cable will be of high quality—why you can be sure Anaconda Butyl (AB) Cable is the finest rubber-insulated cable you can buy.

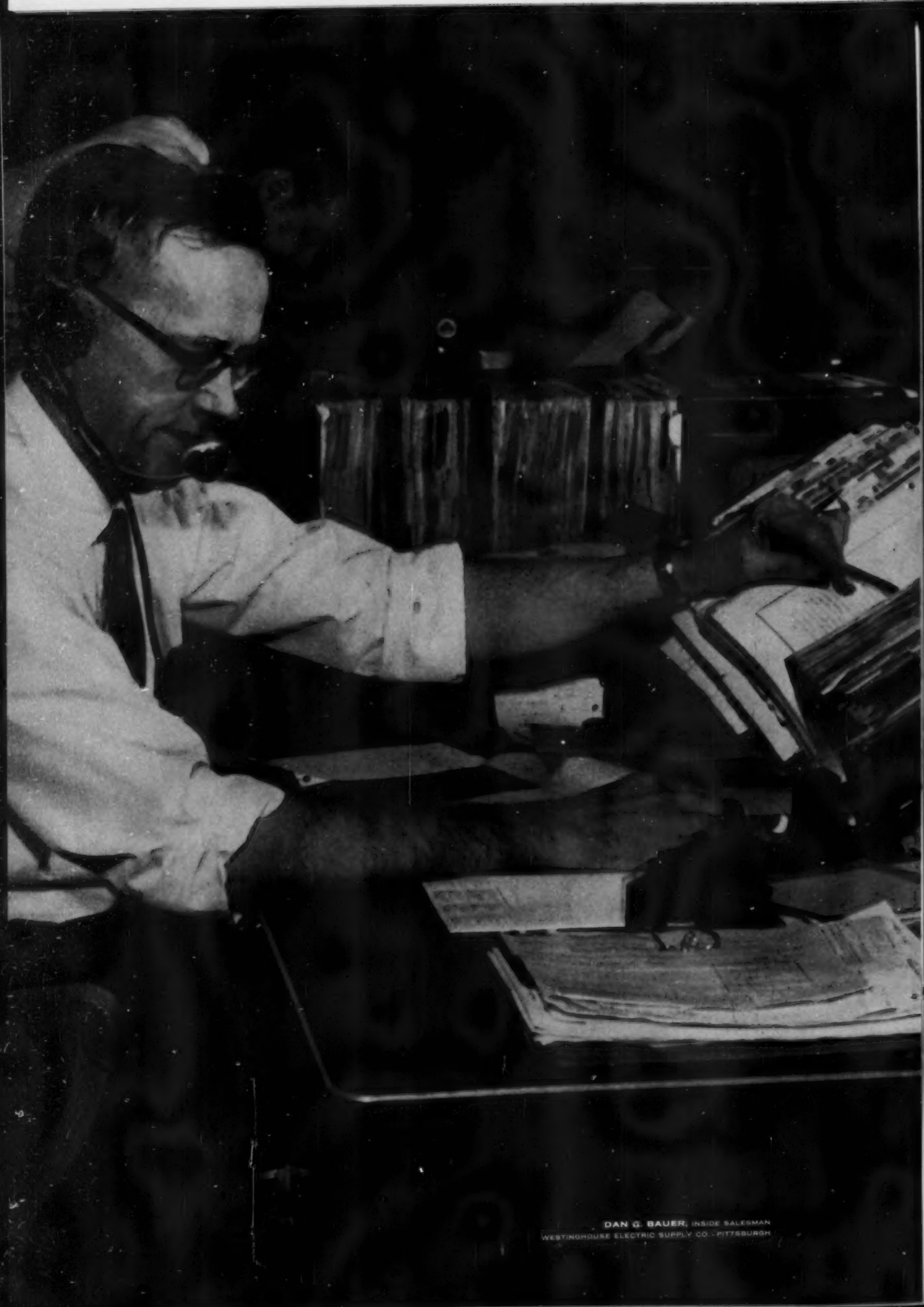
Everything you need to know about Anaconda Butyl (AB) high-voltage cable is neatly summed up in a new booklet, DM-5903, "Anaconda High-Voltage Durasheath* Cable." For your copy, write to: Anaconda Wire & Cable Co., 25 Broadway, New York 4, N. Y. *Reg. U.S. Pat. Off.

ASK THE MAN FROM

ANACONDA®

ABOUT BUTYL (AB) HIGH-VOLTAGE CABLE

For more facts circle 569 on Reply Card



DAN G. BAUER, INSIDE SALESMAN
WESTINGHOUSE ELECTRIC SUPPLY CO. - PITTSBURGH

YOUR WESTINGHOUSE DISTRIBUTOR INSIDE SALESMAN—

ALWAYS AVAILABLE TO SAVE YOU MONEY

You know him well . . . though you may never have *met.*

Every time you call your Westinghouse distributor, you recognize his courteous and friendly voice. Inside Salesman is his title, but that doesn't *begin* to describe the jobs he does for you.

Materials consultant, order writer, expediter, trouble-shooter, hub of communications . . . his main function is *service.*

He'll take your order on the phone. He knows what's in stock . . . offers guidance on your purchases . . . and more than that, he'll make sure you get the order when you need it.

You've probably marveled at his encyclopedic knowledge . . . able to answer any question you may ask from his "six-foot" shelf of catalogs.

Yes, the Inside Salesman is often the most important man in the whole distributor operation. He's the man you can count on when the pressure's on.

He's one more excellent reason it pays *you* to do business with your Westinghouse electrical distribution outlet. Call him next time you need fast delivery of quality electrical products. J-94139

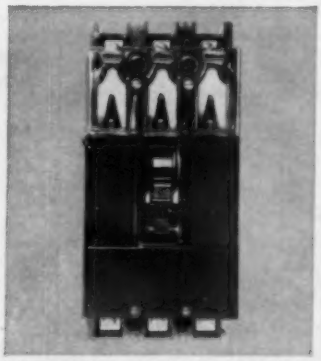
YOU CAN BE SURE...IF IT'S

Westinghouse

WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV ALTERNATE FRIDAYS

Here are some of the many products stocked by your Westinghouse distributor

Westinghouse dry-type transformers are approximately 50% smaller and lighter than other transformers of equivalent ratings, enabling distributors to carry standard stocks — for immediate delivery — for ratings up to 75 kva.



Westinghouse SAF-T-VUE* breakers are unique in their ability to provide safe, sure circuit protection, yet let you see whether contacts are open or closed.

*Trade-Mark

Westinghouse Life-Line® "A" motors. Standard motors in distributor stocks provide a complete line immediately available for many "special" motor requirements.

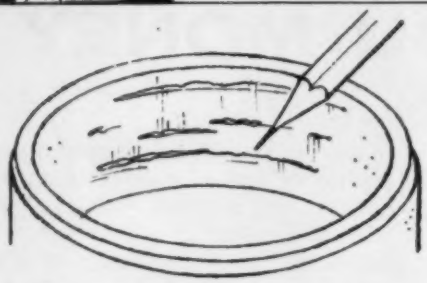
Watch for the Westinghouse Industrial Apparatus Caravan

For more facts circle 570 on Reply Card

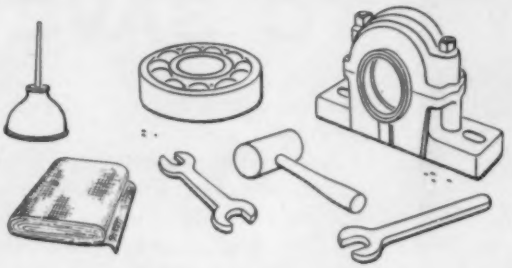
DISTRIBUTOR DAN the SKF bearing man, tells

WHAT DIRT DOES TO BEARINGS

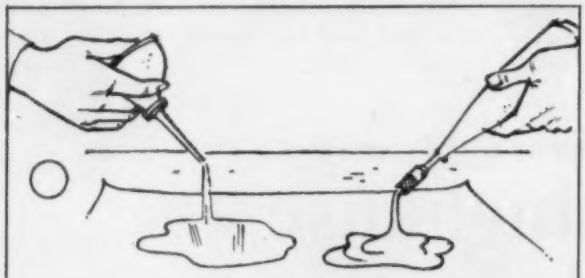
—and how you can help keep it out



LOOK FOR POLISHED, CLEARLY-MARKED BALL OR ROLLER PATHS. They're sure signs that dirt is getting into your bearings, causing lapping of the parts and ultimate failures. To eliminate this problem, follow the steps shown here.

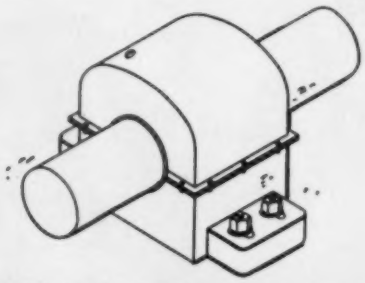


START WITH GOOD "HOUSEKEEPING." Work with clean tools in a clean area. Before you replace a bearing, clean the housing—both inside and out. Always handle a used bearing as carefully as you would handle a new one.



LOOK OVER YOUR LUBRICANTS AND LUBRICATING EQUIPMENT. Dirty oil and grease carry foreign matter with them, right into the bearing. So check them for cleanliness before you use them —and your grease guns and oil cans, too.

IS THE SEAL BENT OR WORN? If it is, dirt and dust and other foreign matter can get into the bearing. If moisture or water is present, you'll need seals made of special moisture-resistant materials.



WHERE DIRT IS A CONTINUAL PROBLEM, try shrouding the bearing housing in a metal box like the one shown here. It's inexpensive, easy to build and helps deflect dust and dirt away from the bearing.

Whenever you're baffled by a bearing problem, consult your Authorized SKF Distributor. His staff of experienced bearing specialists are always ready to serve you—and he stocks all types and sizes of the bearings you need, ready for immediate delivery.

SKF

AUTHORIZED DISTRIBUTOR

6006

Spherical, Cylindrical, Ball, "Tyson" Tapered and REED Miniature Bearings

EVERY TYPE—EVERY USE

SKF®

SKF INDUSTRIES, INC., PHILADELPHIA 32, PA.

For more facts circle 571 on Reply Card

*REG. U. S. PAT. OFF.

THE BRIDGE TO *Progress* AND *Safety*...

The bridge in this picture, designed to carry both horse power and man power across the Root River, represents a step to further expansion of Western Printing and Lithographing Company facilities in Racine, Wis.

Western selected Globe's Safety GRIP-STRUT grating on this bridge for greater safety and for greater economy. Safety GRIP-STRUT is the new basic material, all in one piece (including channels), not welded, riveted or expanded, in steel or aluminum, in standard sizes and gauges. It presents an open space, in a diamond pattern, in excess of 55% of the area for a positive NON-SKID footing in all directions. It is also ideal for work platforms, stair and ladder steps, flooring, balconies, catwalks, machinery guards, fire escapes and for original equipment safety treads.

IMPORTANT SAFETY FEATURES:

Fire proof, slip proof, maximum strength, minimum weight, easy to stand and walk on, cool in summer, warm in winter.

BIG ECONOMY FEATURES:

For balconies—no extra light needed below—no extra heat. No extra supports needed—Channels are integral part of the material. No secondary sprinkler heads necessary. Self cleaning. Cut and installed like lumber by your own maintenance force. Low in original cost.

Write for new complete catalog. Distributors in all principal cities. Consult yellow pages in phone book under "GRATING".

116

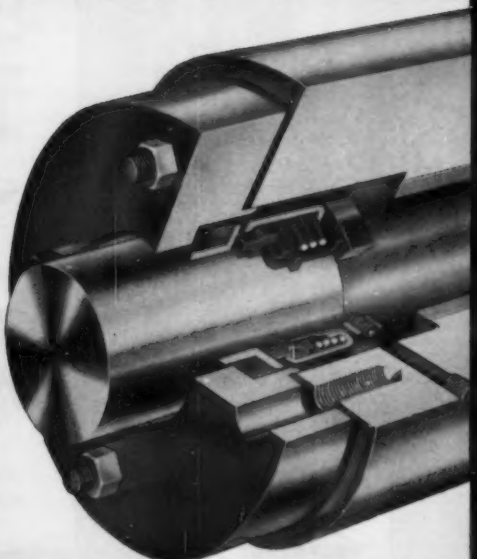
PRODUCTS DIVISION | *The Globe Company*

4016 S. PRINCETON AVENUE • CHICAGO 9, ILLINOIS

For more facts circle 572 on Reply Card

CHEVRON Packings can be applied against water, steam, oil, gases and chemicals to 600°F.

LATTICE-BRAID Packings are used to 700°F in water, steam, oil, gasoline, inert gases, acids, caustics, other chemicals.



PK MECHANIPAK Mechanical Seals operate at temperatures to 212°F, pressures to 150 p.s.i. in water, oil, alcohol, mild acids and solvents.

ENGINEERED PRODUCTS

for Plant Maintenance

A greater number of utilities and industrials are standardizing on Garlock for low-maintenance, leak-free sealing throughout the plant.

For rams, plungers, and reciprocating rods, Garlock CHEVRON* Packings offer positive, low friction service. With an exclusive hinge-like construction, CHEVRON packing rings tighten to prevent leakage as pressures increase. When pressures decline, the rings ease off to permit free operation of the rod, ram, or piston without leakage. CHEVRON packing rings provide adequate heel clearance for easy installation. Once installed, further gland adjustment is rarely, if ever, necessary. Catalog AD-104.

For rotary and centrifugal shafts, valve stems, and reciprocating rods, rams, and plungers, Garlock LATTICE-BRAID* Packings are engineered for longer packing life. They employ a through-and-through braiding construction. As illustrated, each strand passes diagonally through the packing at a 45° angle. This unique construction makes a completely unified structure, resulting in greater strength. Since there is no single outer braid to wear through, Garlock LATTICE-BRAID wears far beyond the limits of ordinary packings. Catalog AD-131.

For rotary shafts, Garlock PK MECHANIPAK Mechanical Seals are easy to install and maintain. They are completely self-contained . . . no parts to put together. Rotating portion simply slides onto shaft; stationary portion positions quickly. Once installed, further adjustment is unnecessary. No parts of the seal move on the shaft or sleeve, eliminating wear on the shaft. Available in shaft sizes from 3/8" to 3" for shaft speeds up to 2000 f.p.m. and higher. Catalog AD-150.

Take advantage of Garlock's years of experience with sealing problems of all types. Call your local Garlock representative at the nearest of Garlock's 26 sales offices and warehouses throughout the U.S. and Canada. Or, write for the catalogs indicated.

GARLOCK

The Garlock Packing Company, Palmyra, New York

Canadian Div.: The Garlock Packing Company of Canada Ltd.

Plastics Div.: United States Gasket Company

Order from the Garlock 2,000 . . . two thousand different styles of Packings, Gaskets, Seals, Molded and Extruded Rubber, Plastics Products

*Registered Trademark

For more facts circle 573 on Reply Card

Industry-proved through a quarter century of service...THERE'S NO DOUBT ABOUT NEOPRENE

ROUGH TREATMENT

another ex-enemy of portable cord... thanks to neoprene jacketing

There is only one place to test a product's ability to withstand the abrasion and physical abuse of in-plant operating conditions. That's on the job, in hard service.

And on the job is where neoprene cable jacketing has *proved* its ability to protect portable cords from gouging, tearing, abrasion and impact. In industrial plants, in the oil fields, and in coal mines, cables jacketed with neoprene have demonstrated their wearability time and time again.

On top of this excellent physical durability, neoprene synthetic rubber jacketing offers resistance to oils, chemicals, ozone, weathering, heat and sub-zero cold. No other jacketing material has such a versatile combination of properties. No other jacketing material has been so thoroughly proved in actual service. E. I. du Pont de Nemours & Co. (Inc.), Elastomer Chemicals Department PE-4, Wilmington 98, Delaware.

DU PONT NEOPRENE

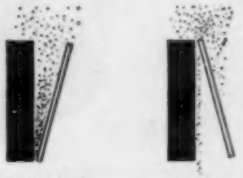
Better Things for Better Living . . . *through Chemistry*

For more facts circle 574 on Reply Card

enough dirt to stop an ordinary D-C magnetic brake

Clark's exclusive design feature, magnet hinged at the top, gives the Clark D-C Magnetic Brake an important advantage over ordinary magnetic brakes where the magnet literally forms a wedge-shaped dirt trap.

From the diagrams at right you can see for yourself how important this difference can be for dependable, maintenance-free brake operation in dust and dirt saturated mills and industrial plants.



ORDINARY BRAKE

CLARK BRAKE

In the Clark Brake, because the widest part of the gap between magnet and armature is at the bottom, any dirt which does get through the smaller gap at the top falls through harmlessly.

Not so with an ordinary brake. Here, because the widest part of the gap between magnet and armature is at the top, dirt not only has easier access into the magnet gap and linkages but it is more likely to pack at these points. When this happens the brake's operation stops . . . production comes to a halt.

And you won't find the operating linkage and adjusting mechanism on the Clark D-C Magnetic Brake buried down in the frame and under the wheel as with ordinary D-C brakes. It's at the top — away from ankle-high dirt in mills and plants—where it is openly accessible for easy inspection and quick adjustment when required.

For more details on the extraordinary Clark D-C Magnetic Brake see your nearest Clark Controller sales representative. Or write direct to Clark Controller.

9MB1

The **CLARK CONTROLLER** *Company*

"Everything Under Control"

Main Plant: *Cleveland 10* • **Western Plant:** *Los Angeles 58*
In Canada: *Canadian Controllers, Limited, Toronto*

For more facts circle 575 on Reply Card

Your hearing mechanism is a remarkable device. With it you can detect sounds over wide ranges of intensity, discern pitch, and establish direction . . . but, the ear has failings. It does not permit you to assign accurately and consistently a definite number that relates the intensity of one sound to others. This can only be done with sound-measuring equipment that is free from human characteristics such as emotions, susceptibility to previous noise exposure, and psychological effects. The Sound-Survey Meter (or the more versatile Type 1551-B Sound-Level Meter) provides an accurate means of assigning a value that indicates noise magnitude in terms of a standard reference level. Once sound levels have been given a value, one is well on the way to the control of potential noise hazards and the evaluation of acoustic-treatment procedures.

The Type 1555-A Sound-Survey Meter

. . . can help you solve your noise problems

One-hand Operation . . .

Function and Level Controls operated with thumb and fingertips. Function switch permits selection of meter characteristics based on ASA standards for sound-level meters. Two check positions are included to show condition of batteries at a glance.

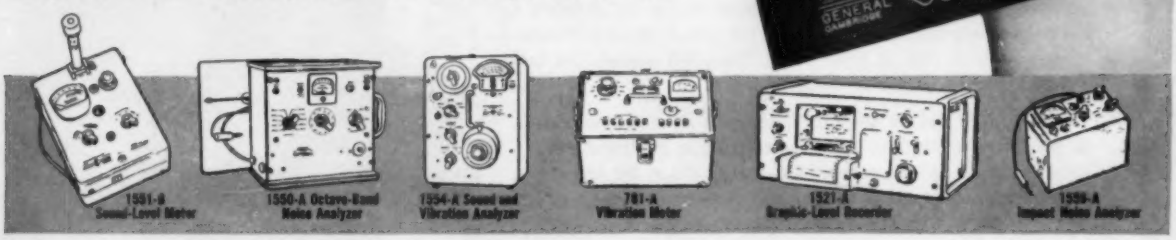
Easy to Read . . .

Sound level is given by setting of Level Control plus meter reading. For example, instrument in photo indicates 100 db plus 4 db or 104 db. Range is from 40 to 136 db above standard reference level.

Compact . . . . . fits in coat pocket

Inexpensive . . . . . only $ 165

In Addition General Radio manufactures a complete line of meters, analyzers, a recorder, and accessories for thorough investigations and analysis of noise and vibration problems. Write for complete information.



For further information write for General Radio Sound Bulletin

GENERAL RADIO COMPANY

WEST CONCORD, MASSACHUSETTS

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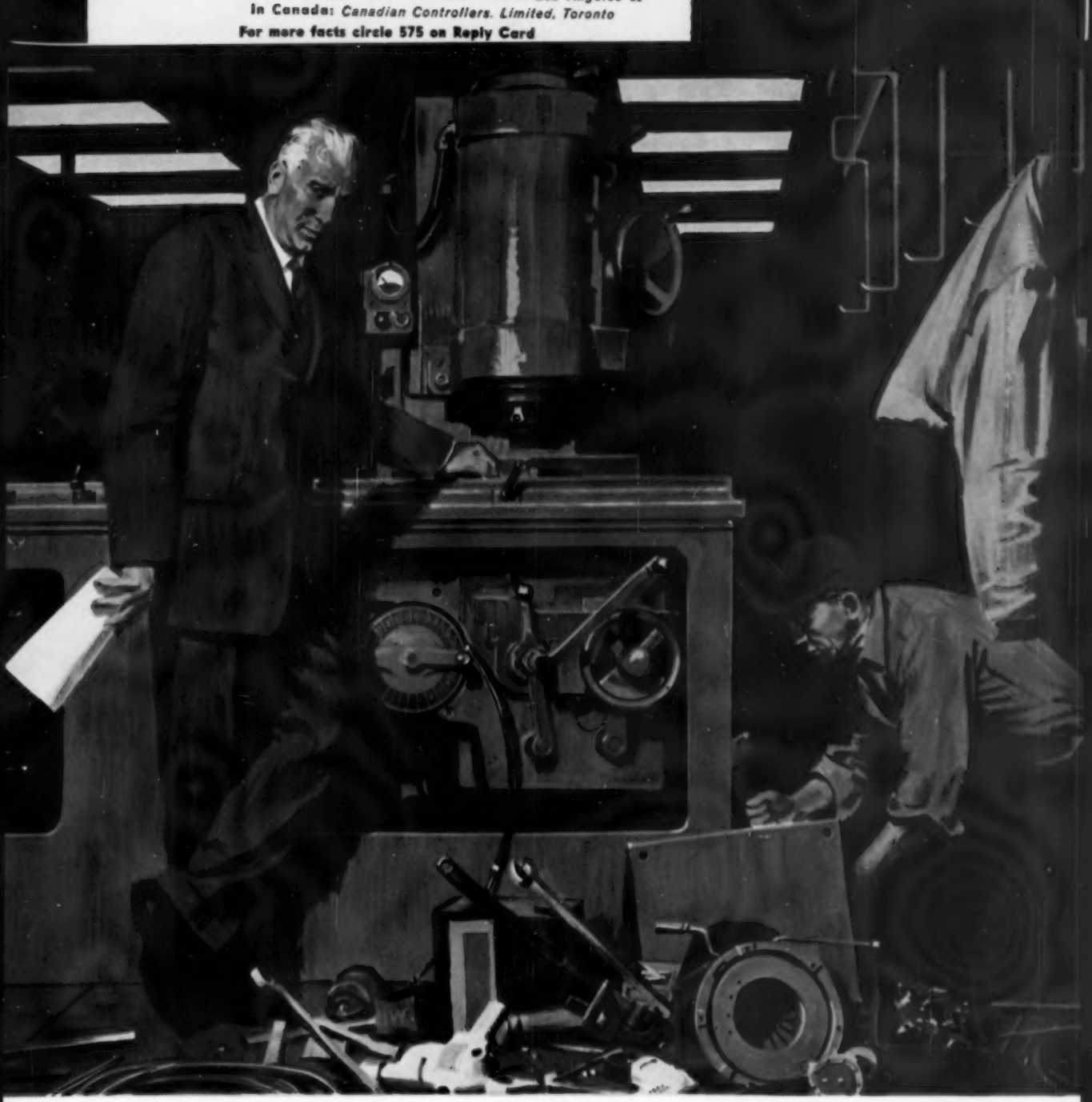
For more facts circle 576 on Reply Card

For more facts circle 577 on Reply Card →

In Canada: *Canadian Controllers, Limited, Toronto*
For more facts circle 575 on Reply Card



NOW HE KNOWS WHY

lubrication is a management responsibility

MANAGEMENT *does* have a stake in good lubrication practices.

If you recognize lubrication for what it is — a cost-reducing tool, not an expense item — you can effect savings that add up to many hundred times the cost of the lubricants themselves. Yet only management has the authority to make these potential savings an actuality. That's why lubrication is your responsibility. **Texaco can help you achieve these savings.** Texaco Lubrication Engineers have had valuable experience in tailoring Organized Lubrication Programs to the needs of virtually every industry. They can help show *you* the way to important savings. Why not talk to your nearest Texaco Lubrication Engineer today — or write for our new Book "Organized Lubrication — Major Cost Control Factor."

Texaco Inc., 135 East 42nd Street, New York 17, New York. Dept. E-140

LUBRICATION IS A MAJOR FACTOR IN COST CONTROL

LOWEST COST LIGHTesT WEIGHT

INLAND SMALL PATTERN 4-WAY* SAFETY PLATE

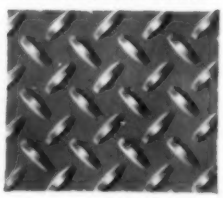
It's a fact—Small Pattern 4-WAY Safety Plate gives you all the protection of raised-lug pattern steel, yet saves many pounds of weight in the finished job and many dollars in initial costs—*Gives you more square feet of protection per dollar than any other rolled steel flooring.*

Thousands of uses in every plant and office—for kick plates, scratch plates, column covers—on walls, truck beds, work benches, machinery platforms, mobile equipment—also on stairways and catwalks where weight-saving is a major factor.

Small Pattern 4-WAY is easily fabricated into any desired shape—can be drilled, sawed and punched with ordinary hand tools. It's easy to maintain and lasts for years.

INLAND small pattern 4-Way safety plate is 18 gage and weighs only 2.4 lbs. per sq. ft. It comes in widths up to 42″ and lengths up to 152″, with a $\frac{5}{8}$″ lug.

AVAILABLE FROM YOUR STEEL SERVICE CENTER



*Registered Trademark

INLAND STEEL COMPANY • 30 W. Monroe St. • Chicago 3, Ill.

For more facts circle 578 on Reply Card

PHYSICAL PROPERTIES	ARMAFLEX 22	BRAND A	BRAND B	BRAND C	BRAND D
LOW DENSITY (less than 7.5 lbs. per cu. ft.)	YES	NO	YES	YES	YES
LOW WATER VAPOR TRANSMISSION (less than .15 Perm)	YES	NO	NO	YES	NO
LOW WATER ABSORPTION (less than 3% by volume—28 days)	YES	NO	NO	YES	YES
DIMENSIONALLY STABLE AT 200° F. (less than 5% lineal shrinkage—28 days)	YES	YES	YES	NO	NO
DIMENSIONALLY STABLE AT 220° F. (less than 5% lineal shrinkage—28 days)	YES	NO	NO	NO	NO
NEGLIGIBLE ODOR	YES	NO	NO	(?)	NO
SELF-EXTINGUISHING	YES	YES	YES	(?)	YES
OZONE RESISTANCE	YES	YES	YES	YES	YES
SMOOTH SURFACE	YES	(?)	(?)	(?)	YES

Properties evaluated by tests at Armstrong Research and Development Center
(?) indicates results are inconclusive or classification a matter of individual judgment

What's better about the new Armstrong Armaflex 22?

This chart tells you at a glance why the improved Armaflex 22 gives superior performance on pipe covering work. New Armaflex 22 features a temperature range from below zero to 220° F.; a super-smooth exterior surface; and greater toughness and durability. For complete information on this fine quality flexible foamed plastic insulation, send for new booklet. Write to Armstrong Cork Company, 2204 River Road, Lancaster, Pennsylvania.

Armstrong INSULATIONS

1860-1960 Beginning our second century of progress

For more facts circle 579 on Reply Card

Use this IMPERIAL select from industry's

No matter what your tube fitting requirements — for low- or high-pressure circuitry — **see your Imperial Distributor.** He carries industry's most complete stocks in a full range of sizes and types, ready to serve your needs. And he also has the tubing tools that assure easy-to-make, leakproof tubing installations.

Ask for Catalog No. 200.

	SURGE CONDITIONS			
	S-1 MINOR SURGE Use 4-1 safety factor	S-2 SURGES up to 50% Use 6-1 safety factor	S-3 SURGES up to 100% Use 8-1 safety factor	S-4 SURGES of 100% to 150% Use 10-1 safety factor
HI-SEAL Brass				
Steel				
Stainless steel				
Aluminum				
BRAZE-SEAL Steel				
Stainless steel				
HI-DUTY Brass				
3. **FLEX** Brass				
COMPRESSION Brass				
4. **POLY-FLO** Brass				
NYLO-SEAL Nylon				
INVERTED FLARE Brass				
SAE 45° Brass				
JIC 37° Brass				
Steel				
Stainless steel				
8. **PRESSURE HOSE & REUSABLE COUPLINGS**				

FOOTNOTES:
1. Tubing should be double-flared.
2. End of tubing must be outside tinned to fill any seam.
3. End of tube should be belled when FLEX FITTINGS are used in sizes over 1/2" or when used for Medium Pressures on sizes over 5/16".
4. Recommendations based on use with Poly-Flo Polyethylene Tubing.

IMPERIAL

THE IMPERIAL BRASS MANUFACTURING COMPANY,
6300 West Howard Street, Chicago 48, Illinois
Dept. PE-40

Good tube circuitry demands not only the best fittings—*but also the best tools:*

tube fitting chart...
widest line

PRESSURE CONDITIONS *					VIBRATION CONDITIONS				TUBING TO BE USED **							
LOW 0-200 PSI	MEDIUM 200-500 PSI	MEDIUM HIGH 500-1200 PSI	HIGH 1200-3000 PSI	EXTRA-HIGH 3000-9000 PSI	Negligible Vibration	Minor vibration	Major vibration Minor tube movement	Major tube movement	COPPER	SEAMLESS STEEL	BRAZED STEEL	ALUMINUM	STAINLESS STEEL	POLYETHYLENE	NYLON	HOSE
S-1	S-1	S-1	S-1 S-2													
S-1 S-2 S-3	S-1 S-2 S-3	S-1 S-2 S-3	S-1 S-2 S-3													
S-1 S-2 S-3	S-1 S-2 S-3	S-1 S-2 S-3	S-1 S-2 S-3													
S-1 S-2	S-1 S-2	S-1 S-2														
S-1 S-2	S-1	S-1														
	S-1										2					
S-1																
S-1 S-2 5																
S-1 S-2	S-1 S-2 6							7								
S-1 S-2	S-1	S-1									1					
S-1 S-2	S-1 S-2	S-1									1					
S-1 S-2 S-3	S-1 S-2 S-3	S-1 S-2 S-3	S-1 S-2 S-3								1					
S-1 S-2 S-3	S-1 S-2 S-3	S-1 S-2 S-3	S-1 S-2 S-3								1					
S-1 S-2 S-3	S-1 S-2 S-3	S-1 S-2 S-3	S-1 S-2 S-3								1					

5. Recommended for working pressures to 125 psi—1/4" and 5/16" O.D.; 100 psi—3/8" O.D. Temperatures from -90° F. to + 175° F.
6. Recommended for working pressures to 250 psi. at temperatures up to 120° F.
7. When used with flexible plastic tubing.
8. See catalog for type of hose and couplings which meet your specific conditions.

S-1 Recommended for S-1 Service Conditions.
S-2 Recommended for S-2 Service Conditions.
S-3 Recommended for S-3 Service Conditions.
S-4 Recommended for S-4 Service Conditions.

HOW TO USE THIS CHART

Indicates **ESPECIALLY RECOMMENDED** for this purpose.

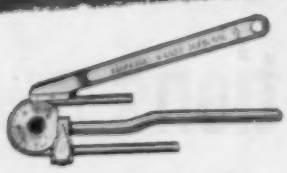
Indicates **CAN BE USED** for this purpose.

Numerals in Solid Circle or Ring—Use is subject to conditions as shown in footnotes.

Whenever possible select a fitting with a solid circle under each of the conditions applying to the job. If no one fitting has a solid circle in each classification, then select a fitting with solid circle or a ring in each classification.

*Allowable working pressure will vary with the diameter of the tubing and the tubing material. For specific information write to factory.

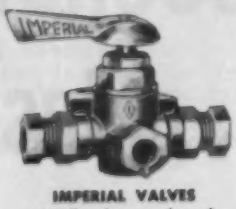
**It is assumed tubing selected will be of material, temper and wall thickness adapted for pressure and application involved.



IMPERIAL TUBE BENDERS
Lever, gear and spring types.

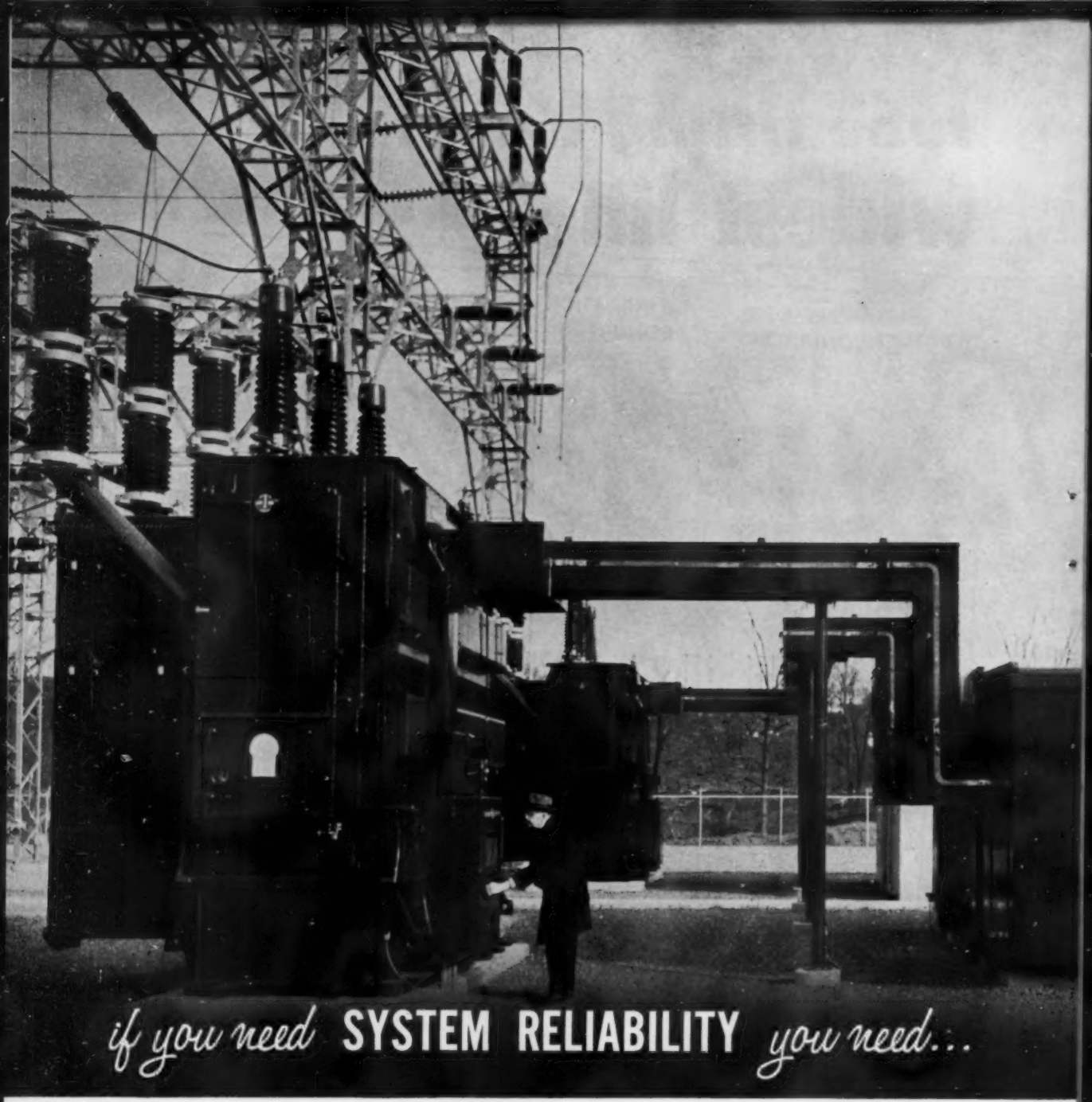
IMPERIAL FLARING TOOLS
All types for making 45° and 37° flares — single and double.

IMPERIAL TUBE CUTTERS
For tubing 1/8 to 2 1/4 O.D.

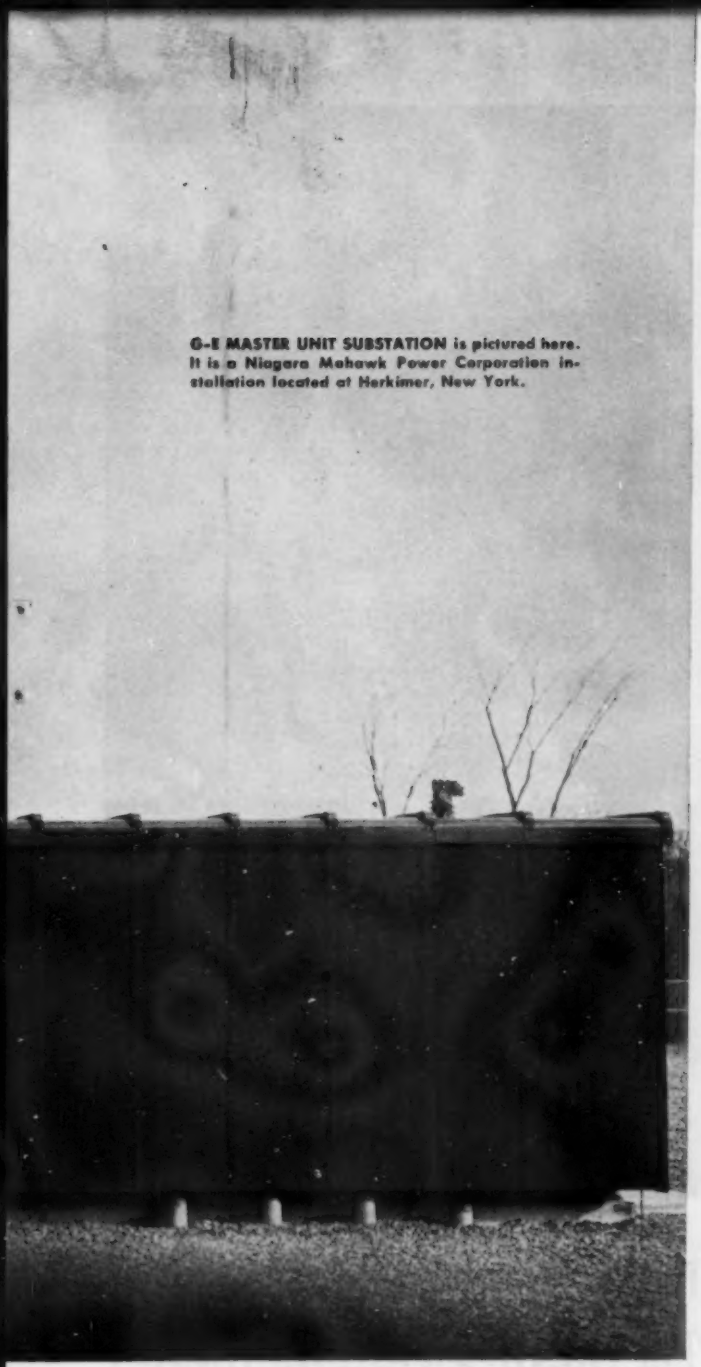


IMPERIAL VALVES
Needle, plug, toggle and diaphragm types.

For more facts circle 580 on Reply Card

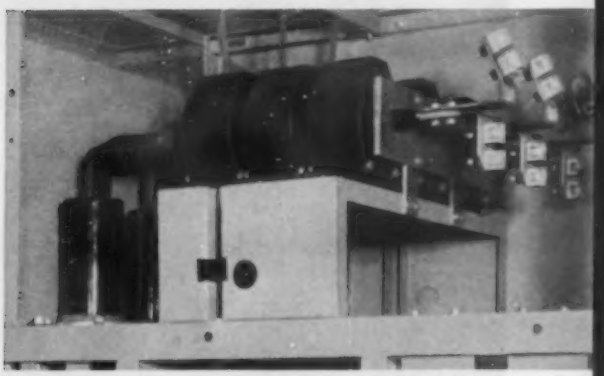


COORDINATED General Electric Master Unit Substations



G-E MASTER UNIT SUBSTATION is pictured here. It is a Niagara Mohawk Power Corporation installation located at Herkimer, New York.

COORDINATED manufacturing skill, developed through years of pioneering in the electrical industry, is a vital ingredient of every G-E master unit substation.



COORDINATED components such as butyl-molded current (shown above) and potential transformers are another key to improved station performance.

COORDINATED testing at modern switchgear and transformer laboratories helps assure coordinated master unit substations, designed for top system reliability.

Today, system reliability is a frame of reference against which other considerations—price, delivery, installation—must be placed when distribution equipment is involved.

At General Electric, the challenge of increased system reliability is being met by designing completely coordinated master unit substations to fit individual system requirements.

This coordination takes many forms:

- **Coordinated Manufacturing Skills** mean that transformers, switchgear and other components are engineered by experts; manufactured by craftsmen for top system reliability.
- **Coordinated Components,** specifically designed to complement each other, afford more reliable transformation and fault current protection.
- **Coordinated Design Testing** puts all master unit substation components through their paces under duplicated field conditions.

When you evaluate your substation plans, be sure to consider reliability inherent in system coordinated G-E master unit substations. For more information contact your G-E Apparatus Sales Office or write for bulletins GEA-3800D and GED-4052, General Electric, Schenectady 5, N. Y. 512-33

Progress Is Our Most Important Product

GENERAL ELECTRIC

For more facts circle 581 on Reply Card

TOUGH BUYERS demand Reznor unit heaters...
In 70 years, only 1/10 of 1% factory replacement!

When you specify heating equipment for your plant, you've got to be a "tough buyer." You've got to know that the unit heaters you order will work right to begin with, and keep on working right over the years! That's why so many plant engineers specify Reznor. There may be less expensive heaters on the market, but none with Reznor's long-term performance record: only 1/10 of 1% factory replacement in 70 years!

EVERY UNIT FLAME-TESTED... You get extra assurance Reznor heaters arrive in top running order. We flame-test each unit before shipment. Save the expense of bench-testing!

LONG-TERM FUEL SAVINGS... It's comforting to know that Reznor heaters keep your fuel bills low over the long haul. You can select a sensitive, low-voltage thermostat and controls, and two-speed fan with automatic speed selector to keep heat even, without blasts. That's why a Reznor uses less fuel to maintain proper heat.

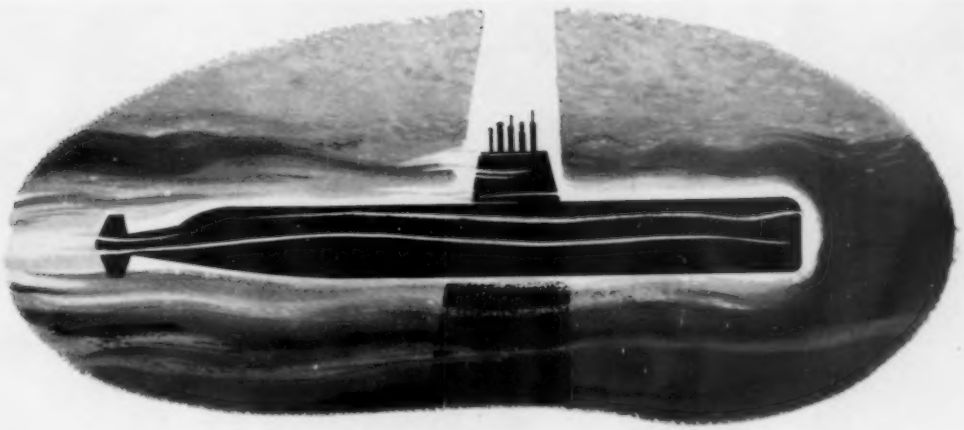
For complete information and catalog, phone your nearby Reznor distributor, or write Dept. 91A, Reznor Manufacturing Company, Mercer, Pa.

For more facts circle 582 on Reply Card

The heating world is full of tough buyers; that's why Reznor is the world's largest selling direct-fired heater!

REZNOR HEATERS

"THE TOUGH BUYERS' LINE"



how activated charcoal solved a no. 1 problem of our atomic subs ...fresh air

The scarcest commodity aboard our atomic subs is not fisionable material—it's plain old fresh air.

Take a hundred men, hermetically seal them in a huge steel tube, then submerge the tube for days at a time.

Call the result the "Nautilus" or the "Triton" and you have an idea of the problem of building submarines to utilize the power potential of nuclear energy. They can literally stay submerged as long as the crews can stand the confinement.

Even without other contamination, just breathing would soon make the air within the tube unbearable. Then add body odors, a kitchen, a lot of complex machinery, areas where smoking is permitted, lavatories and waste tanks and you have a real problem.

To solve the problem, the Navy turned to one of the oldest and most effective methods of air purification—adsorption by Activated Charcoal.

Barnebey-Cheney Activated Charcoal filters are a standard part of the subs' air conditioning systems. Others are installed on the waste tank vents, still others in the lavatories. Odors and contaminants are trapped and held in the Barnebey-Cheney Activated Charcoal.

The same principle can be applied to heating, ventilating and cooling of homes, offices, schools, hospitals or public buildings where fresh, healthful, odor-free air is essential. Barnebey-Cheney builds a complete line of air purifiers for applications of any size, from disposable filters for window coolers to central system purifiers for the huge new Dallas Auditorium.

As in the atomic submarines, *true* air conditioning *must* include *air purification*. Activated Charcoal is the proven, practical means of accomplishing it. To learn more, write for Bulletin T352, Barnebey-Cheney, Columbus 19, Ohio.

Barnebey Cheney

For more facts circle 583 on Reply Card

but only the Westinghouse Lamp has six

Despite similar appearance and ratings, these fluorescent lamps are *not* the same. One is a better lamp—and a better buy—because it's the only fluorescent lamp with all 6 advances described below. That lamp is made by Westinghouse. It costs you no more than any other leading brand—but it will give you years of trouble-free, efficient lighting.

1. **MORE EFFICIENT PHOSPHORS**—A special Westinghouse process selects Ultralume™ phosphor particles of a size proven to give more efficient lighting.

2. **BRIGHTER END TO END**—Lead wires are plated with super-hard Chrome Vanadium to make sure Westinghouse tubes *stay* bright, end to end.

3. **BUILT-IN "SHOCK ABSORBERS"**—Specially designed Westinghouse anodes act as buffers to cushion the terrific shock of electron bombardment and improve lamp life.

4. **"RAINCOATS" FOR RELIABLE STARTING**—Silicone "raincoats"

important advances that make it a better buy!

disperse moisture which can collect on exterior surfaces and prevent lamps from starting.

5. MIXED GASES—Westinghouse uses a precise mixture of certain rare gases, under exact pressure, to improve the light output.

6. TRIPLE-COILED ELECTRODES—To protect electrodes from the sudden electron bombardment when the lamp is first turned on. Emission material is quickly heated, fully protected.

Regardless of the type or wattage of fluorescent lamps you buy, you will get better value, more light for your money, and longer, trouble-free service if you specify and insist on Westinghouse fluorescent lamps. Westinghouse makes a complete line, from tiny 4-watt lamps for instrument lighting to the giant 96-inch Super-Hi™ Lamps for store, street, and factory lighting. Contact your authorized Westinghouse lamp agent or nearest Westinghouse sales office.

YOU CAN BE SURE...IF IT'S Westinghouse

WESTINGHOUSE LAMP DIVISION, Westinghouse Electric Corporation, Bloomfield, N. J.

For more facts circle 584 on Reply Card

When production flow depends on a heavy duty hoist . . .
LO-HED® PERFORMANCE COMES BEFORE PRICE.

When you hit the *really* tough aerial handling problems . . . in places where production flow depends upon continuous hoist performance, and hoist down-time means lost production . . . you need the extra margin of heavy duty performance that only an AE LO-HED hoist can give. Or when you bump into tough headroom problems, LO-HED hoists give you extra feet of lifting height . . . lift loads closer to the ceiling—give you maximum use of every cubic foot in the hoisting area.

The AE LO-HED is built for these trouble spots . . . the spots in your plant where conventional heavy duty hoists just aren't "heavy duty" enough . . . the spots where you are hemmed in by fixed ceiling height . . . the spots where performance comes before price.

For complete information and specifications, refer to Sweets Plant Engineering File 1a/Ae, or write for your copy of our new catalog H-59. AMERICAN ENGINEERING COMPANY, Dept. H-164, Philadelphia 37, Penna.

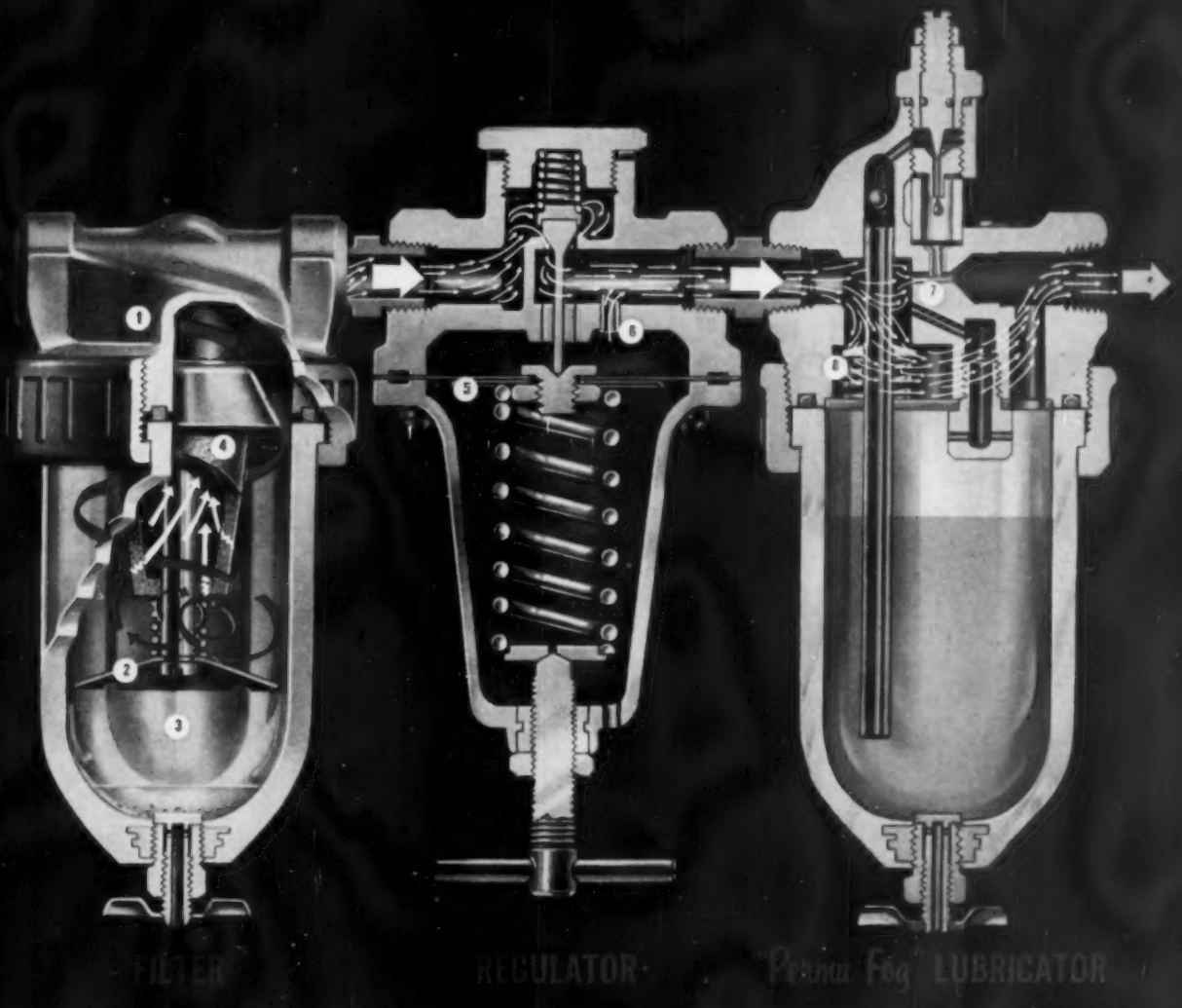
AMERICAN ENGINEERING COMPANY

Hele-Shaw and Hydramite Pumps • Lo-Hed Hoists • Vibra-Grate, Perfect Spread and Taylor Stokers

AE Marine Deck Auxiliaries.

For more facts circle 585 on Reply Card

For more facts circle 586 on Reply Card ⟶



FILTER REGULATOR "Perma Fog" LUBRICATOR

Curved inlet ❶ directs incoming air in downward helical pattern. Larger impurities and condensate are "thrown out" by centrifugal action, collecting on bowl sides and spiraling downward past baffle ❷ into quiet chamber for draining off. Baffle traps sediment in quiet chamber ❸ and allows only dry air centrifugally cleaned of larger impurities to reach porous bronze filter element ❹ where finer particles are filtered out.

Diaphragm of large area ❺ is of BUNA-N—imparts extra sensitivity for response to even minute reduced pressure variations. Aspirator ❻ acts directly on diaphragm, providing instant compensation for fluctuating loads . . . assures precise control and stabilizes pressures reaching individual pieces of equipment.

High velocity venturi section ❼ provides ultra-fine, enduring atomization at air flow rates even less than 1 CFM. An exclusive by-pass feature ❽ provides lubrication at high flow rate without excessive pressure drop—wide range performance in **one unit.** Proof of lubricating efficiency assured because **all** visible metered oil is atomized.

NOW! Get this efficient TRIPLE LIFE-GUARD protection for your pneumatic equipment

A continuous supply of clean dry air . . . at a constant pressure . . . with just the right amount of lubrication provided at points of friction and wear. Air-operated equipment requires this three-way protection today; the Watts combination of pneumatic controls *assures* it.

You can expect *high efficiency* from the Watts line of advanced-design air line filters, regulators, and "Perma-Fog" lubricators. It's the *quality* assembly. Specialists in protection and control devices since 1875, Watts is setting new *standards* of efficiency in pneumatic operation.

WATTS

FILTERS
REGULATORS
LUBRICATORS

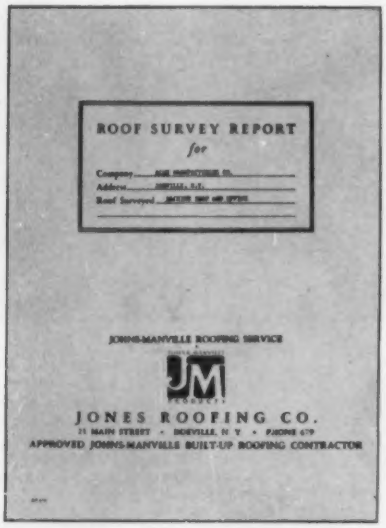
YOUR SAFE PROTECTION

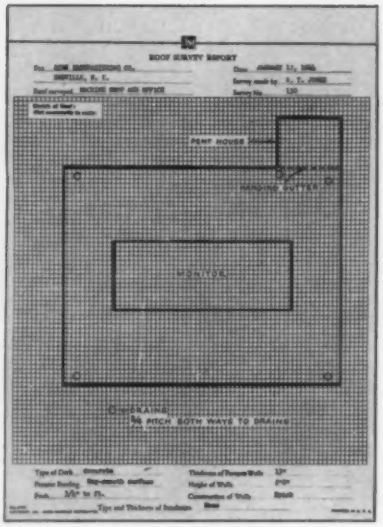
Watts Regulator Company — Industrial Division — 6 Embankment Road — Lawrence, Massachusetts

SEND FOR NEW CATALOG

It's a technical bulletin as well as catalog, describing the complete line of Watts Pneumatic Products. Complete engineering and operational data is furnished so that each page is, in fact, a specification sheet. Saves valuable time for the designer.

Let trained eyes give you this money-saving roof report





When you call in your approved Johns-Manville Contractor, it costs you nothing for a detailed written report on the state of your roof. That's right—*nothing!* His trained eyes are quick to spot present troubles and quick to see where trouble is sure to come. And he knows how to cure roof ills that might cost you thousands of dollars.

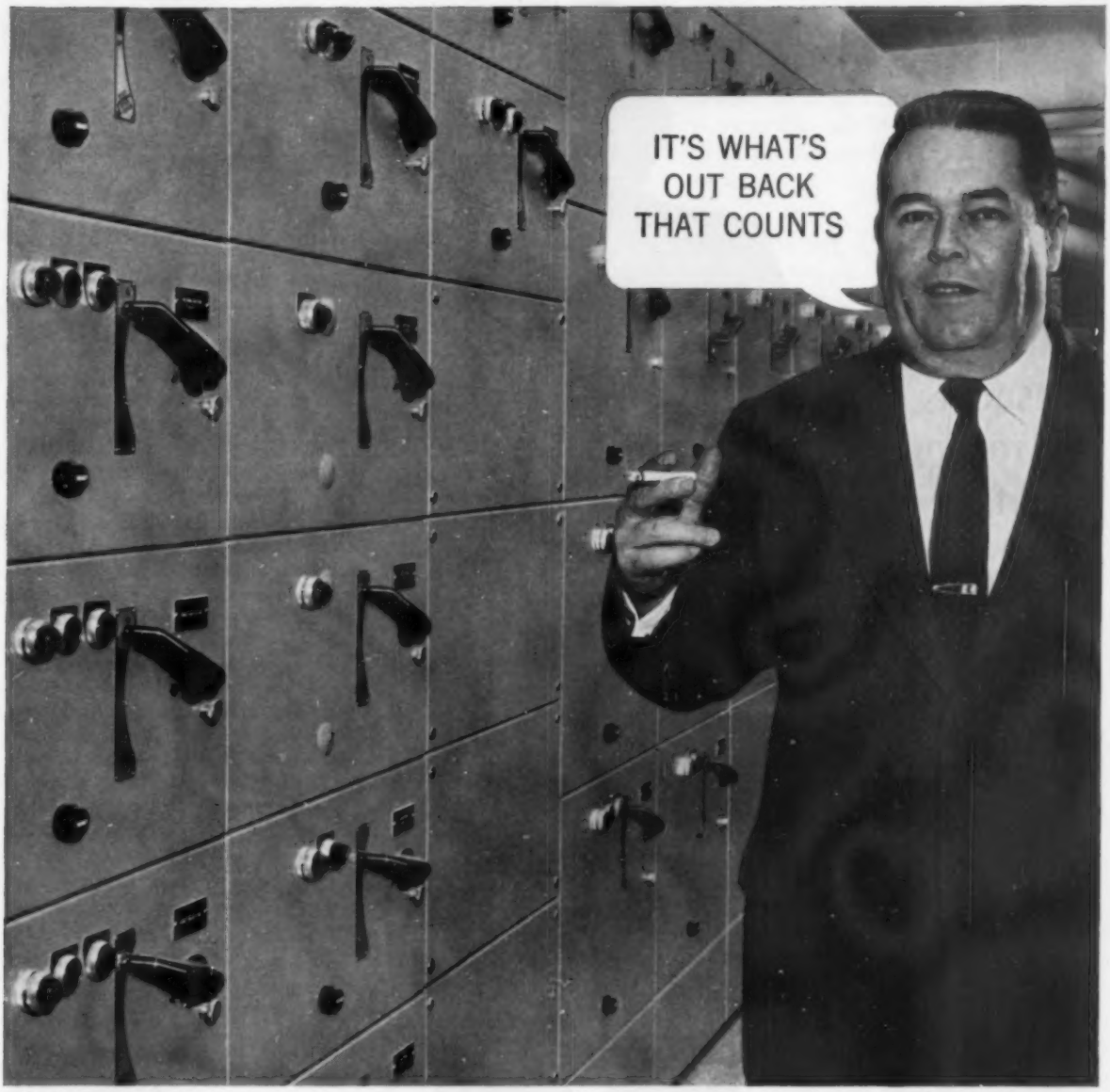
Take advantage of this exclusive Johns-Manville Roof Survey plan today. Call in your approved J-M Roofing Contractor. Find out what your roof needs are or will be—and how he can cure them with quality Johns-Manville Roofing Products. He is listed in the Yellow Pages under "Roofers," or write to Johns-Manville, Box 158, Dept. PE-4, 22 East 40th Street, New York 16, New York.

JOHNS-MANVILLE

J-M 7★ 7-STAR VALUE PRODUCTS

For more facts circle 587 on Reply Card

Saves valuable time for the designer.



The learned buyer of motor control centers

The circuit breakers hardly show on a modern motor control center. But they do the work. Get good circuit breakers and you get good protection . . . extra insurance of continuous electric power . . . lowest net cost. Get poor breakers and you invite trouble. What make can you buy most confidently? Motor control center builders prefer I-T-E over all other makes. Better value. Yet costs no more.

Write for the new bulletin on I-T-E molded case circuit breakers. I-T-E Circuit Breaker Company, Dept. SA, 1900 Hamilton Street, Philadelphia 30, Pa.

I-T-E CIRCUIT BREAKER COMPANY

For more facts circle 588 on Reply Card

"Red" Davis, Flintkote salesman and roofing expert, says...

NOW YOU CAN BRUSH A BRIGHT METALLIC LOOK—A TIGHT PROTECTIVE COATING ON YOUR PLANT WITH FLINTKOTE'S NEW ALUMINIZED STATIC® COATING!

"That's right. Just a brush or a spray is all you need to have a brilliant, metallic coating on your plant roof, water tank or other exposed surface areas. Flintkote's new Aluminized Static is a protective coating that gives all the high reflective insulating qualities of aluminum plus the waterproofing and durability of asphalt static coating.

"In fact, no other known form of bituminous coating will outlast Aluminized Static when exposed to weather! You can use Aluminized Static—the only asphalt emulsion containing aluminum—on metal, masonry, rock wool, glass or asphalt-covered surfaces. Aluminized Static dries very fast to a tough, even coating. It won't flow when subjected to the hottest sun. It can't burn since it has no flammable solvent. And Aluminized Static doesn't stain or alligator-crack over any normal type of asphalt sub-surface. The metal pigment in Flintkote's Aluminized Static is evenly dispersed—not just on the surface."

Aluminized Static has been proved to have exceptional waterproofing and corrosive-resistant qualities.

For particulars and literature, see your Flintkote representative. You'll find him a great guy to work with . . . and he knows his stuff in building materials.

The Flintkote Company, 30 Rockefeller Plaza, New York 20, N. Y.

FLINTKOTE

America's broadest line of building products.

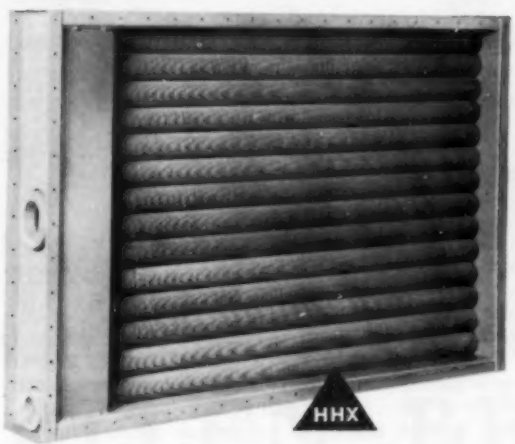
For more facts circle 589 on Reply Card

Here's your complete guide to steam heating coils in fan systems

Blast Heating Coils for most general purpose heating, ventilating and air conditioning. Copper tube and aluminum or copper fin construction for steam pressures up to 200 psi. Available in face areas from 1.88 to 29.17 sq. ft., standard, medium and low temperature rises.

Steam Distributing Tube Coils also used in heating, ventilating and air conditioning systems. Each tube is fed from an inner perforated supply tube providing uniform steam distribution when throttling. Ideal where input air is at freezing temperature. Sizes and performances identical with Blast Heating Coils.

Heavy Duty Coils built with finned tough wrought iron pipe to resist internal and external corrosion in continuous duty high pressure systems and industrial processes—*exclusive with Westinghouse*—face areas range from 3.33 to 29.10 sq. ft., steam pressures up to 200 psi.



Sturtevant Division fan system components include Air Handling, Air Cleaning and Heating & Cooling Products—all from a single source with a single warranty—*best* for service and satisfaction.

Call your Sturtevant Division Sales Engineer or write Westinghouse Electric Corporation, Dept. DE00, Hyde Park, Boston 36, Mass. *. . . Pioneers and pacesetters in air treatment for 100 years.*

YOU CAN BE SURE...IF IT'S Westinghouse

J-80700

Watch Westinghouse Desilu Playhouse on CBS Alternate Fridays.

For more facts circle 590 on Reply Card

NEW PRODUCTS AND PROCESSES summarized for your convenience

Edited by M. E. Heniken

To receive product data circle item numbers on the handy Reader Service Card provided on pages 275-276.

1—CUBIC AIR FILTER offers longer service life

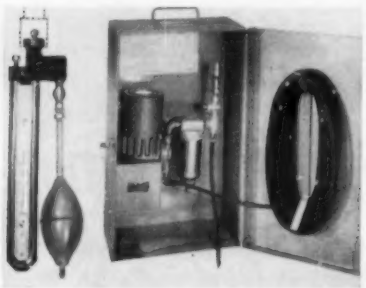
ULOK Cubic Air Filters are "cube" replacement units said to last six times longer than most throw-away and permanent metal type filters. High capacity filtering action is attributed to a lightweight Dynel modacrylic filtering medium, and open-side cube construction. These filters are for use in air-conditioning and heating, dust entrapment, and process air systems. Shaped like an open box, the unit is made of three components: the disposable high loft, 2-in. thick filter medium; a "basket" or retainer, into which the medium fits; and a retainer wire that fits inside the medium to hold it rigid.

In operation, the air stream carries dirt into the cube to the front surface of the downstream face of the filter. As dirt builds up on the downstream face, air flow is shunted to the sides of the cube. Coarse material continues to be caught on the downstream face while the large filter area of the four sides traps the fines, manufacturer explains, and the result of this progressive "reverse loading" is that the

unit shows unusually low pressure drop even after collecting several pounds of dirt. The filters, UL listed as Class II, are available with standard face areas of 20 by 20, 20 by 25, 16 by 20 or 16 by 25 in. For each of these there are units measuring 8, 11 and 20 in. in the direction parallel to the air stream. Company says that the area of a bank of filters required for a given job may be halved by switching from flat filters to 20-by-20-by-8-in. ULOKs, larger savings being possible using units measuring 11 and 20 in. parallel to air stream. Disposal is simple. When filled to operating capacity, the filters may be collapsed and discarded. The dust is in the bag. Union Carbide Development Co., Div., Union Carbide Corp.

2—LEAK DETECTOR simplifies checking of piping

De-Tekta-Leak is announced as a simple device for checking for leaks in gas piping systems, refrigeration systems and others. It consists basically of a U-tube manometer with connection fittings and a rubber bulb



or small power-driven pump to build up pressure in the system. A leak-tight shutoff cock is provided to seal off the system after it has been pumped off. Then you watch the manometer to see if the indicated pressure is retained. Loss of pressure indicates a leak. Illustration (not to scale) shows De-Tekta-Leak at left, with optional air compressor. Eclipse Fuel Engineering Co.

3—QUICK DRY COATINGS for wood, metal surfaces

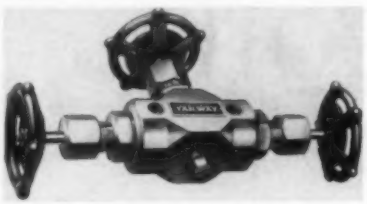
Speedy-Dry Coatings are said to provide a fast drying film on wood and metal surfaces. According to manufacturer, they air-dry to touch in less than 30-min. The coatings may be applied by spray, brush, or dipping techniques and dry to a high gloss finish. Colors include a semi-gloss primer, and gloss finishes in chrome, green, black, red, gray, and yellow. Complete details given in Form 259. Rust-Oleum Corp.

4—SPOTLIGHT, narrow beam for long-distance use

This 750-w narrow beam spotlight is claimed to deliver up to three times as much light as comparable types. Fitted with a regular mogul screw base, lamp is manufactured in an R60 hard glass bulb, has an improved light source which projects 50,000 candlepower for power economy and increase light intensities. Internal reflector gives maximum directed illumination in a variety of applications where long distance lighting is needed. Weatherproof glass permits use in low cost lamp holders outdoors. Bulletin 119 gives data. Radiant Lamp Corp.

5—MANIFOLD simplifies the instrument connections

Designed to provide a simpler and more dependable means of making instrument connections to flow meters, level indicators, and others, the Yarway Manifold combines three valves



in one. Two of these provide line shut-off and one equalizes pressures to protect the instrument's internal working parts—together with a connection tap for calibration of the high pressure side of the system. The manifold is furnished with screwed or socket-weld end connections. Body and working parts are stainless steel. Bulletin RI-1825 (Supplement C) gives data. Yarnall-Waring Co.

6—WRITING DEVICE transmits over phone or radio

Electrowriters are designed to transmit written messages or sketches to any point, however distant, over telephone or radio circuits. Transmitting party writes with a ball point pen on plain or form paper, as shown at left. As pen is moved, remote receiver

or receivers reproduce the copy. Any number of instruments, in any desired combination, any distance apart, can be interconnected, company notes, and no extraneous power supplies are required. Instruments are self-

Soft Rubber Boots Prevent Injury to men or machines. A-B pendant stations are available with from 2 to 16 units, plus emergency stop unit in bottom of enclosure.

Allen-Bradley offers the

MOST COMPLETE LINE

of oiltight heavy-duty

CONTROL UNITS

The wide selection of Allen-Bradley Bulletin 800T push buttons and control units will enable you to satisfy each and every control station requirement. A-B control units and stations have seals to exclude oils and cutting fluids—contacts cannot become fouled. And *all* control units have the popular A-B double break, silver contacts that assure reliable operation—without maintenance. The rugged construction, flexibility, and generous wiring room of Allen-Bradley's Bulletin 800T line are "bonus" features. To get the best in every way—insist on Allen-Bradley. Send for Publication 6090, today.

ILLUMINATED PUSH BUTTON
Space-saving two-in-one control unit.

4-WAY SELECTOR SWITCH
Can also be furnished for 2-way operation.

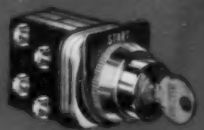
ENCAPSULATED PILOT LIGHT
Transformer type for rugged 6-volt bulb.

PUSH-TO-TEST
Six different color lenses available.

SELECTOR SWITCH
With coin slot operator. Other operators available.

TIME DELAY
Delay adjustable from 0.5 to 5 seconds.

POTENTIOMETER UNIT
Furnished in 2- or 5-watt capacity ratings.



LOCK TYPE
For selector switch or push button operation.

DOUBLE CIRCUIT
Has 2 N.O. or 2 N.C. sets of contacts.

16 UNIT STATION
in die-cast aluminum enclosure. Sheet metal cabinets also available for up to 25 control units.

5-60-BM

ALLEN-BRADLEY

Member of NEMA

QUALITY MOTOR CONTROL

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis. • In Canada: Allen-Bradley Canada Ltd., Galt, Ont.

Yes, Allen-Bradley also makes...

A-B QUALITY

DC Contactors

Here's the only line of DC contactors using the simple solenoid design—with ONE moving part—in all ratings through Size 4. And their double break, silver alloy contacts never need servicing.

BULLETIN 202

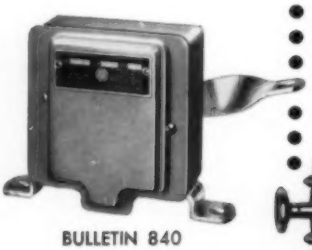
DC Control Relays

These relays are the counterpart of the Bulletin 700 line of AC relays—of which millions are in service. With only ONE moving part—these relays provide the ultimate in long life and reliability. Like the AC line, they have double break, silver contacts that never need maintenance. Made in a variety of types and with up to 8 switching poles.

BULLETIN 200

Float Switches

This versatile line of float switches is available in a wide range of types and enclosures to handle practically every industrial pumping job. They all feature a snap-action switch mechanism for positive operation no matter how slowly the liquid level changes.

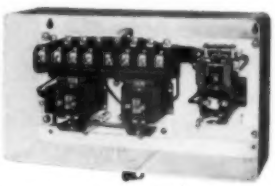


BULLETIN 840

BULLETIN 1209

Loom Switch

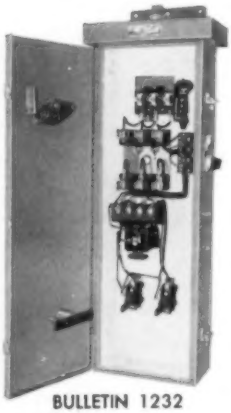
Manual starting switches designed for textile loom service. Design of operating lever makes accidental operation impossible. Lint-tight enclosure eliminates fire hazard.



BULLETIN 1270

Automatic Transfer Switches

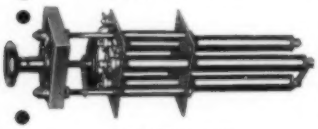
For use where power must be maintained, these panels automatically transfer the load to an auxiliary supply when normal supply fails or falls too low. Transfers automatically when the normal power supply is resumed. Mechanically interlocked.



BULLETIN 1232

Pump Control Panels

Designed for irrigation and oil field pumping applications. Can also be used with outdoor lighting systems. Uses standard A-B Bulletin 709 solenoid starter with manual disconnect switch or circuit breaker in weatherproof enclosure. Available with many optional features.



BULLETIN 410

AC and DC Rheostats

Provide absolutely stepless control over a wide resistance range. Full wattage capacity available at all settings. Sizes to 5400 watts.

6-60-RM

ALLEN-BRADLEY

Member of NEMA

Quality **Motor Control**

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis. • In Canada: Allen-Bradley Canada Ltd., Galt, Ont.

NEW PRODUCTS

(Begins on page 186)

contained and fully transistorized. Systems can be used with message service only, or alternate written messages and voice service. Electronics and Communications Div., Comptometer Corp.

7—THREE-STAGE FILTER is rated at nominal 1 micron

This filter consists of non-woven material sandwiched between a coarse wire screen and a cellulose sheet. Although its primary function is to provide support for the non-woven center media, the wire outer screen also filters out large particles. The inner medium, a resin-impregnated cellulose sheet,

gives additional support to the primary filtering medium and also serves as filter and barrier, providing final "polish" and separation of contaminants. Porosity of the center or main filtering medium can be controlled to a high degree. As fluid passes through this medium, contaminants are held by surface screening adsorption and absorption. According to manufacturer, this material has a high capacity for stopping large quantities of very small particles.

Tests on hydraulic and pneumatic systems are reported to show the three-stage element capable of 1-micron filtration. When common hydraulic fluids are used, the three-stage filter is not affected in a temperature range from as low as —65 up to 275 F. Purolator Products, Inc.

8—SURFACING MATERIAL for floors and roof deck

The Polyrock-Rubberite System for surfacing and waterproofing traffic deck and floors for both foot and wheel traffic features extreme light weight and low cost of materials and installation. System involves a heavily reinforced rubbery blanket beneath the thin but hard surfaced Poly-Rock ma-

← For more facts circle 591 on Reply Card

with CARBO ZINC 11*

Carboline's new zinc filled *inorganic* protective coating

- Water-insoluble 20 minutes after application.
- All-weather application: —20° F. to 150° F., up to 100% humidity.
- All-weather service: —80° F. to 750° F.
- Excellent resistance to water, brine, high humidity and organic solvents.
- Cures from inside out . . . requires no curing solution.
- Resists undercutting and subfilm corrosion.

Carbo Zinc 11 can be used without topcoat or as primer with vinyl, Hypalon or inorganic renewable topcoat for color. Apply with brush or spray. In non-immersion service, it can be applied over a commercial blast surface. It's economical, too . . . low material, application and maintenance costs.

Write today for complete information, technical data, uses and samples of this outstanding, easily applied coating . . . Carbo Zinc 11.

*Patent applied for

carboline COMPANY

32- T Hanley Industrial Ct. St. Louis 17, Mo.

Sales engineers in principal cities. Consult your telephone directory.

COATINGS WITH EXPERIENCE

For more facts circle 592 on Reply Card

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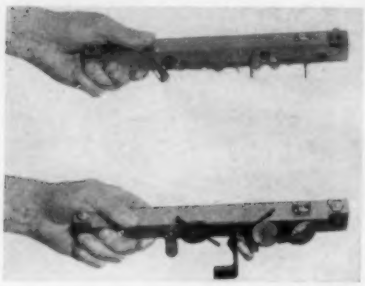
NEW PRODUCTS

(Begins on page 186)

terial claimed to withstand heavy wheel or foot traffic, not dent under furniture legs, or be effected by vibration, water, oil acids, gasoline or salt. In addition to waterproofing course created by the Rubberite, material acts as slip-agent against wearing surface and is claimed to bridge minor base concrete slab cracks and movement. Plant Maintenance, Inc.

9—MAGNETIC UNIT has powerful attraction

Magna-Bar is a non-electric magnetic unit designed for holding or controlling of parts in handling and conveying operations, or removing iron fines or small tramp iron, as illustrated photo. Powered with Erium 25, a Ceramic V barium ferric oxide magnetic



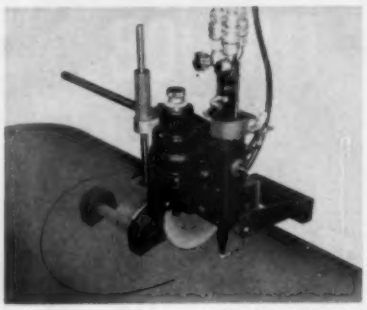
material designed and energized for this use, Magna-Bar can be used as a holding magnet on automated lines, or mounted over or under shallow flows or powders, fibers, non-sticky liquids for removal of fine ferrous contaminants or tramp iron. With steel pole plates permanently bonded to Erium element, unit is a compact 1-by-1 in. in cross section, is obtainable in standard widths of 4 through 72 in., and supplied with non-magnetic stainless steel mounting brackets adjustable from ¼ to ½ in. in depth. Eriez Mfg. Co.

10—EPOXY FLOOR with increased corrosion resistance

Measurably greater chemical resistance than present floor formulations is claimed for this epoxy floor, which is announced as resistant to most acids, alkalies and solvents. Also, because it cures quickly and withstands abrasion, manufacturer suggests it for resurfacing worn floors where speed is essential. It is a topping, approximately ⅛ to 3/16-in. thick, applied to a previously prepared slab, usually concrete. It can be made skid-proof. Company bases its claim of superiority on laboratory tests—involving acetic, hydrochloric, sulfuric and nitric acids—showing that this floor absorbs less liquid in submersion tests than do other epoxy floors. Kalman Floor Co.

11—CUTTER makes openings in pipe or plate

Although designed for cutting round openings in tanks and large diameter pipe, this mechanized hand cutter also makes straight, irregular or circular



cuts in flat plate. A magnetic radius rod permits center fulcrum to rise and fall with the contour of the tank to produce a perfectly round opening. An oxy-acetylene torch, powers a small 110-v variable speed motor, makes it adaptable to cutting varying thicknesses. The cutter weighs 23 lb. Steffan Mfg. Corp.

12—TABLE MACHINE makes low cost copies

Rapid, in-the-office copying is reported practical for small engineering departments with the Paragon-Revolute Rockette, a tabletop dry-diazo copying machine. It is designed to make professional-quality low-cost positive copies of drawings, tracings or printed matter up to 42 in. wide, any length.

A knob controls copying speed, which can be set for a maximum of 15 fpm linear and even at full-speed operation, prints and intermediates are claimed sharp and clear. Developed prints are delivered to the front of the machine in a 12-in. deep tray. The unit is 22 in. high, housed in a steel cabinet with gray hammertone

G-B SNAP*ON DISTRIBUTORS

LISTED IN YELLOW PAGES

(See ad on facing page)

AKRON, Ohio, The Asbestos Supply Co.
ALBANY, Ga., Industry Insulation Co.
ALBANY, N. Y., Hudson Valley Asbestos Corp.
ALBUQUERQUE, N. M., Mt. States Insulation Co.
AMARILLO, Tex., McDonald Engineering & Insulating Co.
ATLANTA, Ga., Reynolds Aluminum Supply Co.
AUSTIN, Tex., Cinbar Engineering Co.
BALTIMORE, Md., Leroy Insulation Co.
BANGOR, Me., Eastern Glass Co.
BATON ROUGE, La., Eagle Asbestos & Pkg. Co.
BEAUMONT, Tex., Solar Supply Co.
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BOSTON, Mass., Homans-Kohler, Inc.
BUFFALO, N. Y., Industrial Insulation Sales, Inc.
CHAMPAGNE, Ill., Lewie David Co.
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KANSAS CITY, Mo., Central Supply Co.
KEWANEE, Ill., Mechanical Insulation Co., Inc.
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LITTLE ROCK, Ark., Gunn Distributing Co.
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LOUISVILLE, Ky., General Insulation & Roofing Co.
MACON, Ga., Industry Insulation Co.
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MONTGOMERY, Ala., Shook & Fletcher Supply
MOORHEAD, Minn., Fargo-Moorhead Insulation Co.
NASHVILLE, Tenn., Reynolds Aluminum Supply Co.
NEWARK, N. J., Eastern Steam Specialty Co.
NEW ORLEANS, La., Eagle Asbestos & Packing Co.
NEW YORK, N. Y., Eastern Steam Specialty Co.
ODESSA, Tex., Western Chem. & Supply
OKLAHOMA CITY, Okla., Ball Distributing & Engr. Co.
OMAHA, Nebr., Cardinal Supply & Mfg. Co.
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PHOENIX, Ariz., Kircher Asbestos & Rubber Co.
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PORTLAND, Me., Eastern Glass Co.
PORTLAND, Ore., Western Fibrous Glass
RALEIGH, N. C., Reynolds Aluminum Supply Co.
RAPID CITY, S. D., Robbins & Stearns Wholesale
RICHMOND, Va., Reynolds Aluminum Supply Co.
ROANOKE, Va., C. E. Thurston Co.
ROCKFORD, Ill., Mott Brothers Co.
SALT LAKE CITY, Utah, Bullough Asbestos Sup. Co.
SAN ANTONIO, Tex., San Antonio Machine & Supply Co.
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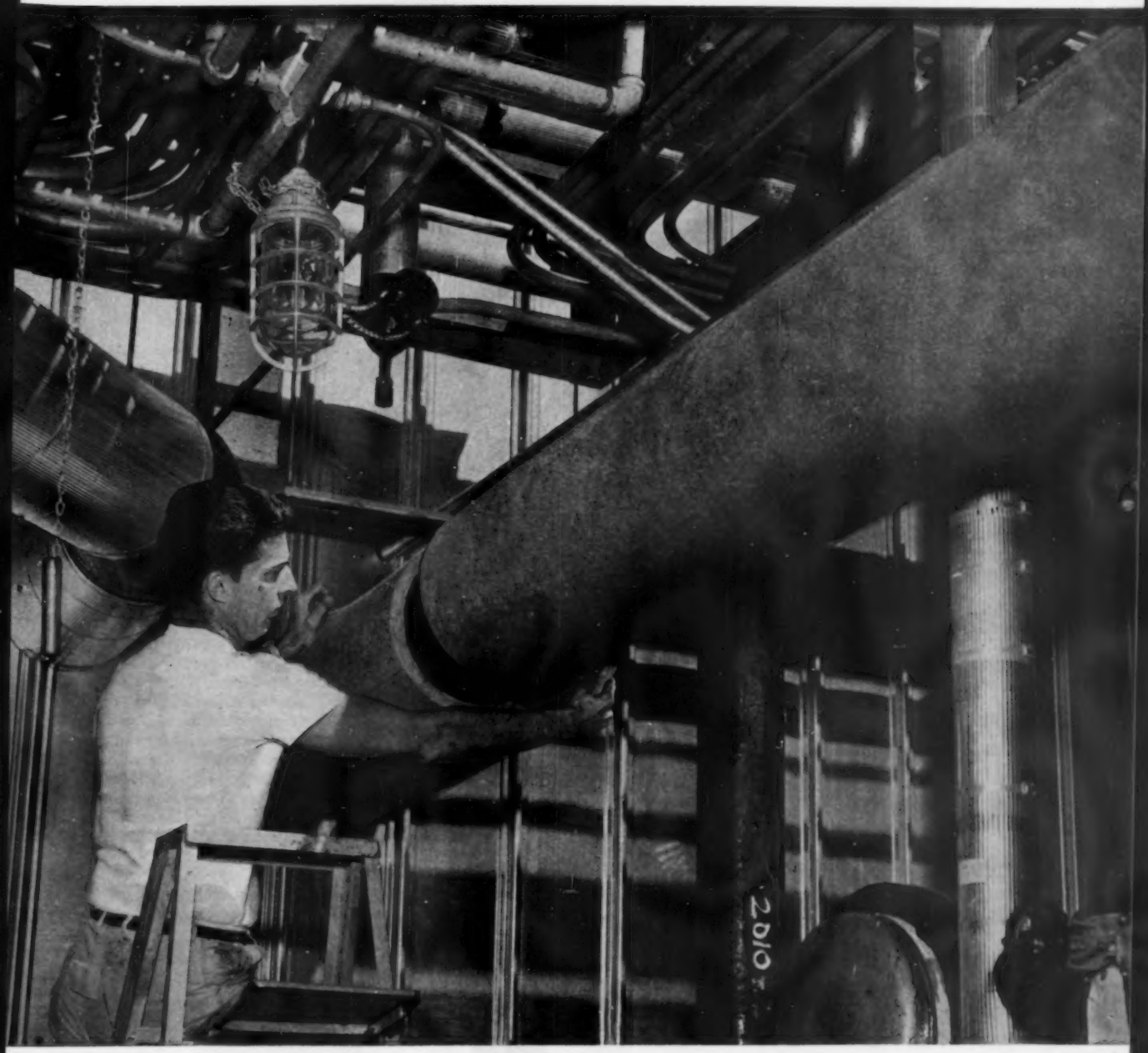
SAN FRANCISCO, Calif., Western Fibrous Glass Prod. Co.
SAVANNAH, Ga., Reynolds Aluminum Supply Co.
SEATTLE, Wash., Western Fibrous Glass Products Co.
SHREVEPORT, La., Frith Sales Co.
SOMERVILLE, Mass., Insulation Products, Inc.
ST. LOUIS, Mo., The Stovey Company, Inc.
ST. PAUL, Minn., Asbestos Products, Inc.
SULLIVAN, Ill., Lewie David, Inc.
SYRACUSE, N. Y., Burnett Process, Inc.
TAMPA, Fla., Eagle Roofing & Art Metal Works, Inc.
TULSA, Okla., Ball Distributing & Engr. Co.
TUPELO, Miss., Paine Supply Co.
WASHINGTON, D. C., Walter E. Campbell Co., Inc.
WEST PALM BEACH, Fla., Southern Metal Prod.
WICHITA, Kans., General Metals, Inc.



"Piping hot!" ... but easy to insulate with G-B SNAP*ON®!

No need to shut down hot lines when you insulate—not when you use G-B Snap*On, the original one-piece pipe insulation molded of fine glass fibers. It's so easy to apply that you can snap it over a 350° line (shown above) in one easy motion, without risk. Whether you apply it on straight runs, in close, crowded quarters, or under special conditions where workmen must consider their safety, you save all kinds of time with G-B Snap*On.

Thermal efficiency? There's absolutely *nothing* better in general-purpose pipe insulations; in fact, 1½" G-B Snap*On is the thermal equivalent of most 2" insulations! It's also permanent—and reusable. For your next job involving chilled lines or piping up to 350° F., indoors or out, get G-B Snap*On—"the best there is." It's available locally in sizes from copper tubing to 36" IPS—plain, or with the appropriate vapor barrier or weatherproof jacket.

FOR INFORMATION & PROMPT DELIVERY SEE YOUR G-B SNAP*ON DISTRIBUTOR (LISTED IN ADJOINING COLUMN)

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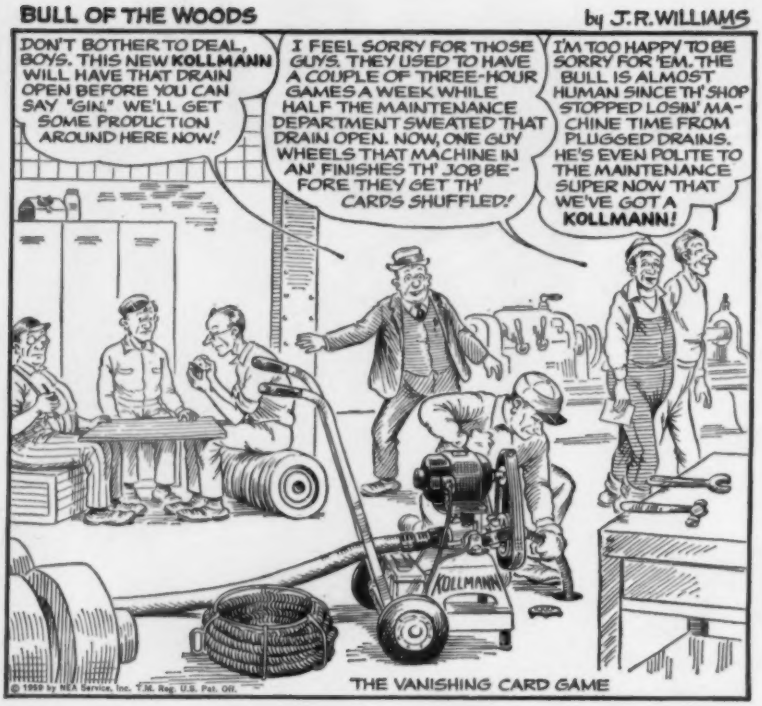
232 West 10th St., Kansas City, Mo.

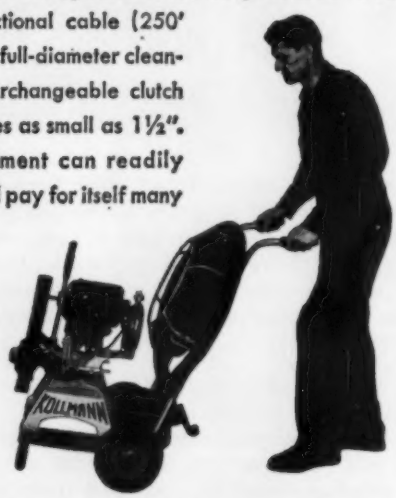
Thermal and acoustical glass fiber insulations . . . molded glass-fiber pipe insulation
Couplings and fittings for plain and grooved end pipe

For more facts circle 593 on Reply Card


BULL OF THE WOODS
by J.R.WILLIAMS
DON'T BOTHER TO DEAL, BOYS. THIS NEW KOLLMANN WILL HAVE THAT DRAIN OPEN BEFORE YOU CAN SAY "GIN." WE'LL GET SOME PRODUCTION AROUND HERE NOW!
I FEEL SORRY FOR THOSE GUYS. THEY USED TO HAVE A COUPLE OF THREE-HOUR GAMES A WEEK WHILE HALF THE MAINTENANCE DEPARTMENT SWEATED THAT DRAIN OPEN. NOW, ONE GUY WHEELS THAT MACHINE IN AN' FINISHES TH' JOB BEFORE THEY GET TH' CARDS SHUFFLED!
I'M TOO HAPPY TO BE SORRY FOR 'EM. THE BULL IS ALMOST HUMAN SINCE TH' SHOP STOPPED LOSIN' MACHINE TIME FROM PLUGGED DRAINS. HE'S EVEN POLITE TO THE MAINTENANCE SUPER NOW THAT WE'VE GOT A KOLLMANN!
KOLLMANN
© 1959 by NEA Service, Inc. T.M. Reg. U.S. Pat. Off.
THE VANISHING CARD GAME

YES, THE KOLLMANN "500" CLEARS *Any* STOPPAGE QUICKLY...THOROUGHLY...

● Designed for industrial use, the "500" makes fast work of stubborn flow line stoppages, eliminates trouble and "down time"... and anyone in the maintenance crew can operate it. The dolly-mounted "500" handles up to 150' of sectional cable (250' with larger power units) for full-diameter cleaning of lines 3" to 10". Interchangeable clutch jaws quickly adapt it to lines as small as 1½". *Every* maintenance department can readily justify this machine... it will pay for itself many times over.



See the full Kollmann line at your distributor, or write for literature.

KOLLMANN
MANUFACTURING COMPANY
Erie, Pennsylvania • Phone: Erie 99-1102
Leading Designer and Manufacturer of Drain Cleaning Equipment Since 1936
For more facts circle 594 on Reply Card

NEW PRODUCTS

(Begins on page 186)

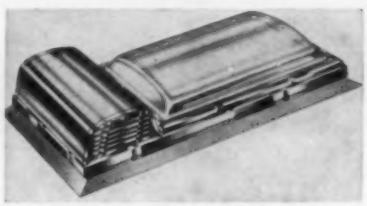
finish. A matching floor stand is available. Using a 1500-w quartz mercury vapor lamp, the machine operates on a 200-v, single-phase 60 cycle current. Paragon-Revolute Div., Charles Bruning Co., Inc.

More information on any of these products can be yours without cost or obligation. Just circle the item numbers on the Reader Service Cards provided on page 275-276.

13—SKYLIGHT UNITS with single, double function

Included in this line are skylights, called Astro-Lites, and combination skylight-ventilators, Astro-Vents, said to be the first dual purpose units suited for heavy-duty industrial requirements. The Astro-Lite consists of a one-piece acrylic resin dome and aluminum frame for installation in a self-flashing, insulated curb. It is furnished with either clear or translucent dome material. Astro-Lites come in a square or rectangular shapes, lengths from 14 to 115 in. Series L units have a single dome; Series D are dual mounted end to end. Continuous daylighting can be achieved with Astro-Lites installed in series.

The Astro-Vent (illustrated) consists of the skylight described plus a

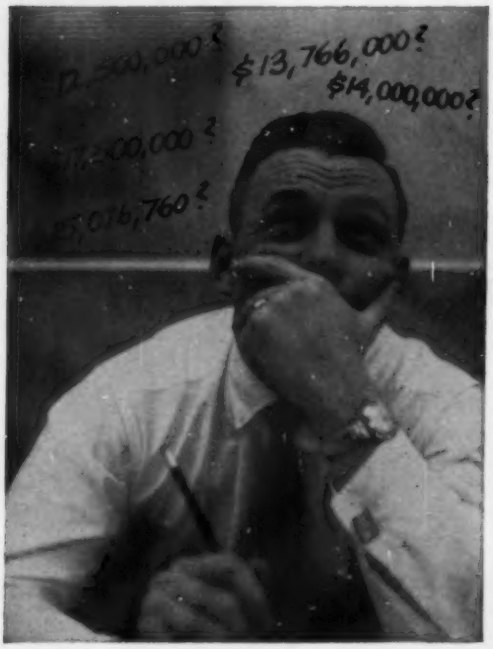


separately housed ventilator—both mounted on a single extruded aluminum frame which fastens to the curb. Where Astro-Vents are used, no other ventilation is necessary, it is stated, and they can be installed even where noise suppression is a critical factor. Available in 1350 model variations, Astro-Vents have air moving capacities from 180 to 4400 cfm. Bulletin 60-LV gives full details. Jenn-Air Products Co., Inc.

14—CLUTCH-BRAKE has independent magnet action

The 2.2 SMBC Clutch-Brake combination has both clutch and brake magnetically set, so that when current is

Announcing the 1960 G-E Fluorescent Lamp



"MONEY SAVER CONTEST"

525 WINNERS

Takes only seconds to enter—Nothing to buy, nothing to write

Here's a guessing contest for lamp users. It's a fun way for General Electric to demonstrate this very important point: *Whatever type of fluorescent you use, General Electric research has produced a lamp that will give you more light for your money.* To underscore the point, we are using our most dramatic new fluorescent, the mighty G-E Power Groove* Lamp.

TOP 25 WINNERS will receive a handsome matched ensemble of decorator-approved lamps for the home—including:

- One swing arm desk lamp
- Two 33-inch-tall matched end table lamps
- One floor lamp
- 12 feet of fluorescent lighting for valances or cornices

All lamps with beautiful matching shades

NEXT 500 WINNERS will win powerful G-E PAR outdoor spotlights with water-proofed socket and 25 feet of cord.

HERE'S ALL YOU NEED TO KNOW TO WIN:

- G-E Power Groove Lamp Fact No. 1—users save from $15 to $85 per lamp on initial installation costs over previous fluorescent types.
- G-E Power Groove Lamp Fact No. 2—The lamp is by far the most popular and successful high intensity fluorescent on the market today.

At this point you become an armchair economist. Just make a guess at how many initial investment dollars *all* G-E Power Groove Lamp users *will save* between June 1, 1959, and June 1, 1960. (We won't have our final estimate until after June 1, 1960, so your guess is as good as anybody's. But here's a tip: We think it will be between 12 and 18 million dollars!)

NOTHING TO BUY . . . NOTHING TO LOSE— Enter now! Get your entry blank and any further information you might need from your G-E Lamp distributor.

General Electric Co., Large Lamp Dept. C-012, Nela Park, Cleveland 12, Ohio.

*General Electric trademark for its non-circular cross section fluorescent lamp.

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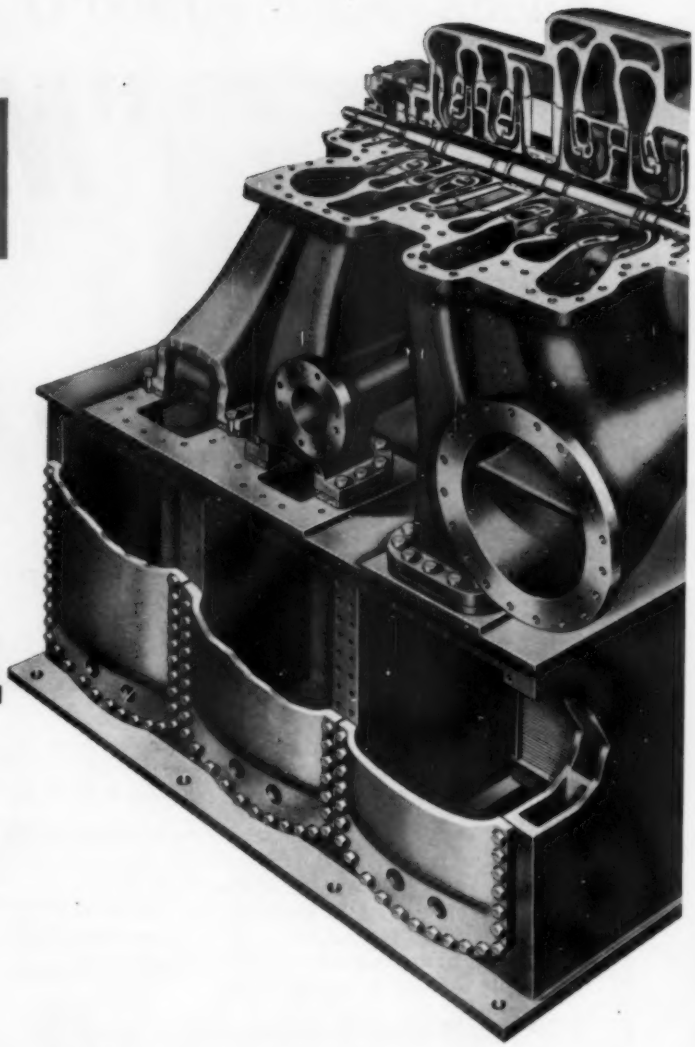
GENERAL ELECTRIC . . . WHERE BRIGHT IDEAS BECOME BETTER LAMPS

For OXYGEN PLANTS and other INDUSTRIAL AIR applications ...this new CLARK Centrifugal Compressor



High purity air is vitally important for the steel industry's new tonnage oxygen plants. While existing compressors could readily handle the service, economic considerations indicated the need for special high performance design.

The result is the new Clark Unatherm Centrifugal Air Compressor, a single case, four stage design possessing an unusually high hydraulic efficiency. To hold horsepower at a low level, the air stream is intercooled between each stage in base-mounted intercoolers. By mounting the compressors over the intercoolers, important savings in space requirements are realized. In addition to inherent compactness, the Clark design requires access to only one side for maintenance. The remaining three sides may be set flush against walls if required.

Another feature of the new Clark Unatherm Compressor is the use of back-to-back impellers to balance out thrust load. Integral bearing construction and single case design limit bearing and shaft sealing requirements to one at each end of the rotor and also eliminate alignment problems.

Being a simple rotative machine, normal maintenance consists of an occasional inspection. If ever necessary, however, the upper half of the case can be removed without disturbing bearings or breaking pipe connections.

In addition to providing primary air for oxygen plants, the Clark Unatherm Compressor is also an excellent choice for other industrial air uses requiring 110 psig air in capacities ranging from 5,000–38,000 cfm. They are ideal first stage compressors for wind tunnels or soot blowing because of their efficiency and air purity characteristics. The same advantages apply to base load, general industrial air applications where the complete absence of pulsation plus unusual compactness are also highly important features.

For more facts circle 596 on Reply Card

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CLARK

COMPRESSORS
ENGINES • GAS TURBINES

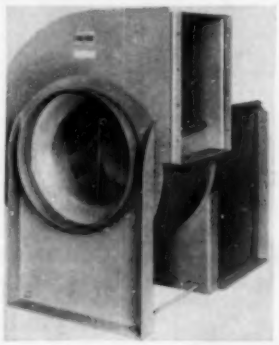
NEW PRODUCTS

(Begins on page 186)

on the clutch magnet and off the brake magnet, clutch will operate and vice versa. There is also a neutral position when current is turned off both magnets in event free wheeling is required. Unit comes in any d-c voltage up to and including 90 v d-c, has a 1.55 current rating, 8 lb torque on both clutch and brake side, and comes complete with bearing mounted drive and driven shafts. It also has its own foot mounting. Bulletin 504-E gives details. Stearns Electric Corp.

15—VENTILATORS with new motor mounting technique

Self-contained, belt-driven centrifugal fans in the Util-A-Set line have motors and fan bearings mounted on rubber isolation rails. Besides serving to eliminate vibration and resonant noise, this



mounting method also provides a wide range of adjustability and allows mounting of several different motor frames on one standard base. The ventilators are designed for applications requiring low and medium ranges of volume and pressure. Backward blade or forward curve wheels are available. Twelve sizes provide capacity range from 688 to 23,000 cfm. Specifications are in Catalog 3401. Ilg Electric Ventilating Co.

16—FLEXIBLE HOSE built to transmit live steam

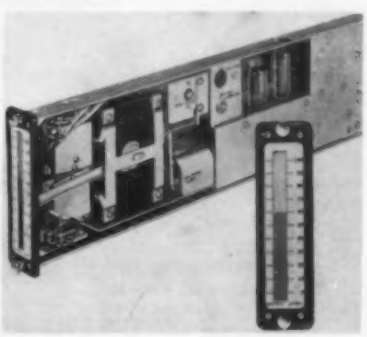
White Line Steam Hose incorporates an extruded Teflon (TFE) innercore, bronze wire reinforcing braid and swaged fittings to provide reliability with resistance to deterioration, abrasion, scaling, blow-offs and leakage. The TFE innercore won't embrittle, work harden or deform even after millions of flexing cycles at 400 F, and resists most chemicals, it is claimed, and the bronze wire protects against rust and is braided in a pattern designed to offer maximum flexibility fatigue life and burst strength. Fittings

are installed with compact swaging dies. The fitting is assembled and forced into the die which contracts the collar around the fitting body—male or female unions, elbows or straight tube fittings may be assembled. This can be done with a small hydraulic press supplied by manufacturer, or with a hand arbor. This hose is available either as assembled lengths or as specialized lengths with separate fittings to be assembled at user's plant. Sizes range from ¼ to 1 in., and burst pressures are given as approximately six times maximum recommended operating pressure. Titeflex Inc.

17—RIBBON INDICATOR fits narrow panel opening

The A22M, an electronic ribbon indicator, measures only 2 in. by 5 3/16 in., fits a 1⅛-by-5 in. panel opening, and is for use in regular panels where space is limited, or in graphic panel installations. It can be mounted vertically, or in a left or right horizontal position. The A22M is a high-amplification, null-balance device operating on the common 0-0.5 v a-c signal with accuracy of ± 1 percent of full signal input and can be supplied with one (high or low) two alarm contacts.

Design is simple. Ribbon-drive mechanism and amplifier are mounted



on the main chassis. Amplifier assembly is a self-contained unit that may be removed in its entirety if replacement is necessary. Only zero and span adjustments are necessary and these can be made from the front of the panel. A magnetic switch linked to the connector lock in the mounting

SARCO TOPICS

HOW TO SOLVE COMMON TRACER LINE PROBLEMS

How to cure water hammer with a steam trap that will operate in vertical position

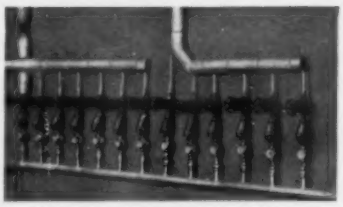
Water hammer is an inherent problem in long tracer lines. So is freezing. Both problems can be overcome, and here's an example of how it has been done. At the Socony Mobil Oil Company's Paulsboro, N. J., refinery, they found that the Sarco Thermo-Dynamic Steam Trap, type TD-50, not only withstands water hammer, but installing the trap in a vertical position —which permits free drainage—presents no problems at all, thanks to its unique thermodynamic principle. In fact, 90% of the 250 TD-50's at this plant are vertically mounted. They never block heat transfer, and they remove condensate and air as fast as they collect.

How to handle varied steam pressures — without adjustment

Can a trap — without adjustment — handle steam pressures that vary from 15 to 160 psi? Can the *same* trap vent air and drain condensate as rapidly as it is formed, be easy to install and require practically no maintenance at all? That was the problem set up by the engineering staff of Armour Chemical Division's McCook plant. They solved it by testing many traps. Their conclusion: Sarco TD-50 steam traps meet or beat their specifications, because:
they discharged condensate as fast as it formed, without wasting steam;
their compact inline construction made installation easy, even in tight quarters;
maintenance was practically negligible;
no adjustment was necessary for varying steam pressures. (In fact, the TD-50 is self-adjusting through its full operating range of 10-600 psi.)

No other steam trap can so adequately solve all these problems at one time.

How to be certain process fluid stays above 280° F. when outside temperature drops to —10° F.



The problem of maintaining design temperatures on tracer lines need not be difficult, no matter how extreme the conditions seem to be. For example, the tracer lines in a phthalic anhydride process at Witco Chemical Company's new Chicago plant had to be maintained above 280° F. Below this temperature, the chemical sets and the whole system would have to be taken apart and re-assembled. That's not all; ambient temperatures sometimes could drop to —10° F.

With reliability as a prime consideration, Scientific Design Company, Inc., who designed and constructed this brand new plant, selected the TD-50.

Because the TD-50 can be mounted vertically, freezing was no problem either. Added benefits that matter on tracer lines: the TD-50 is compact, light in weight, easy to install.

What is the most reliable tracer line trapping method to prevent unscheduled shutdown?

Particularly in refineries, steam traps have to function under exactly the kind of conditions that you'd expect to cause failure—they must function equally satisfactorily on low pressure or exhaust steam and on up through high-pressure, high temperature ranges. Not only that, but outside temperature may vary from subzero to subtropical. If maintaining design temperatures in your tracer lines appears to be hampered by these problems, consider how Phillips Petroleum Company, Kansas City, solved them. They found a trap which drains their tracer lines automatically over a full range of pressure, temperatures and loads. It's the Sarco TD-50 Steam Trap.

With only one moving part—a stainless steel disc, the TD-50 has little that can go wrong. In fact, it's so free of trouble that Phillips Petroleum Company consider their TD-50's as reliable and efficient as the piping. They now rely on 1800 of them throughout the plant. 1408

FOR FULL INFORMATION ON TRACER LINE TRAPPING or on any steam trapping problem—see your Sarco Sales Representative or write to

SARCO COMPANY, INC.
635 Madison Avenue,
New York 22, N. Y.
Plant: Bethlehem, Pa.

STEAM TRAPS • TEMPERATURE CONTROLLERS • STRAINERS • HEATING SPECIALTIES

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SARCO

Here are 7 Sound Reasons Why the Thermo-Dynamic® Does a Better Job of Trapping

1. *Simplicity*—has only one moving part. 2. *Maintenance*—practically zero. 3. *Wide pressure range*—one trap for all pressures from 10 to 600 psi. 4. *Uniform performance*—operates equally well on heavy, light, or no condensate load. 5. *Operates against back pressures*—up to 50% of inlet pressure. 6. *Rugged*—unaffected by superheat, water hammer, vibration, or corrosive condensate. 7. *Minimizes inventory* of spare parts.

Maintenance Time: 40 Seconds. If it now takes your maintenance crew more than a couple of minutes to service an ordinary trap, you're throwing away valuable time. This Sarco Thermo-Dynamic can be cleaned, blown out if necessary, and reassembled on the line in as little as 40 seconds.

For Prompt Information on the TD-50 . . . or for fast help on the efficient solution of any steam trapping problems, get in touch with a SARCO District Office, Sales Representative, or Distributor. (There's one near you.)

Only SARCO makes all 5 types:

Thermo-Dynamic* • Thermostatic • Liquid Expansion • Float Thermostatic • Inverted Bucket

*U.S. Pat. No. 2,817,353 TM Reg. U.S. Pat. Off. 1409

SARCO COMPANY, INC.
635 Madison Ave., New York 22, N. Y.

NEW PRODUCTS

(Begins on page 186)

frame disconnects power from the unit before the cable connector can be removed, it is noted, making the A22M suitable for use in Division 2 areas. Specification Sheet A808 gives details. Swartwout Div., Crane Co.

18—ALUMINUM LOUVERS in fixed and adjustable types

These fixed and adjustable aluminum ventilating louvers feature interchangeable parts and simple assembly. For use in applications ranging up to

heavy industrial, they come in standard sizes to 12-ft heights and 5-ft widths, and are produced from heavy-duty, 0.063-in. aluminum sheet supplied by Aluminum Co. of America. Because all parts are interchangeable, single damage sections may be replaced. Bird screening will be available for inside or outside surfaces. The mechanical fastening system used enables pre-finishing in such aluminum treatments as color anodizing, porcelainizing, baked enamel or painting. Louvers can also be fabricated with patterned sheets. No welding is required; eight aluminum screws hold the louver together. Walcon Corp.

19—SPRAY ENAMEL features 30-min drying time

Spray Rhinamel has been formulated with a 30-min. drying time especially for industrial spray applications. This permits prime and finish dry in 90 min. Available in 30 colors, spray forms a hard, glossy finish and provides long-lasting protection for wood or metal, company says. It is possible to build the desired film thickness by repeated passes of the gun. According to manufacturer, Spray Rhinamel resists abrasion and extremes of temperature, and is recommended for industrial maintenance paint requirements, indoors and out, including refinishing of trucks and stationary machinery, color coding. Tropical Paint Co.

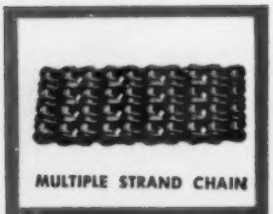
20—HYDRAULIC UNIT controls multiples of jacks

Precision control of multiples of hydraulic jacks or cylinders is said to be provided by this portable hydraulic unit. By unification of oil volume, each jack will raise or lower at precisely the same rate, company says, keeping same level irrespective of weight on jack. The jacks are connected permanently to hoses and the hoses to individual reels. In placing a jack in position, the hoses unwind automatically and jack is ready for use. Units are available operating up to 19 jacks with capacities from 5-30 tons and strokes to 30 in. System is designed to raise, lower, push or pull any type of heavy object with all the jacks traveling at the same rate. Modern Hydraulics, Inc.

21—BALL TYPE INDICATOR for very low flows

For flows down to 0.075 gpm (water) and ½ cfm (air or gas), the Arkon Flow Indicator is designed to show at a glance whether flow is taking place. Said to be clearly visible from a distance, even in bad light, the flow

makes the ball dance in the toughened glass dome. If flow stops ball drops out of sight. It is useful in applications such as air, steam, water, and oil purge lines to instruments and mechanical seals; cooling water to compressors, condensers, jacketed process vessels, laboratory equipment, and electronic equipment; lubricating oil to bearings, and others. Indicator is made in ½-in. pipe for pressures of

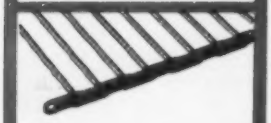

MULTIPLE STRAND CHAIN

WHATEVER YOUR TRANSMISSION NEEDS

ATLAS HAS THE RIGHT ANSWER

EXTENDED PITCH CHAIN

ATTACHMENT CHAIN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OFFSET SIDEBAR CHAIN

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FLEXIBLE COUPLINGS

Atlas has the right chain for your power transmission or conveying needs. All are unsurpassed in quality . . . pre-tested to give better service. Atlas Chains are made in all sizes . . . in steel, stainless steel, bronze and Electrolized finish.

For complete details and technical assistance on your chain design or maintenance problems there's an Atlas Engineer to help you. Get in touch with your local Atlas Distributor or write direct for details and catalog to Atlas Chain & Manufacturing Company, West Pittston, Pa.

NEW POWER DRIVE CALCULATOR

Technical data for selection of roller chain and sprockets in slide rule form. Available to engineers upon request.

ATLAS

For more facts circle 598 on Reply Card

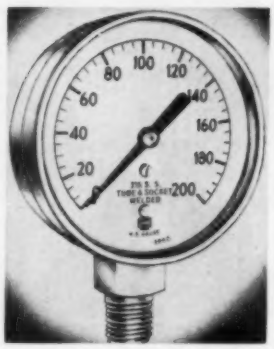
NEW PRODUCTS

(Begins on page 186)

100 psi with die-cast bronze body, and nylon or Teflon ball. McIntosh Equipment Corp.

22—PRESSURE GAGES with stainless components

This line of drawn case pressure gages with all components made of stainless steel is designed for service involving corrosive atmospheres and media. Type 316 stainless steel Bourdon



tube, movement, socket (welded), case and ring are incorporated in the design. Gage meets ASA Grade B specifications, company says, including an accuracy of 2 per cent at the middle, or working half of scale (3 per cent for remainder). Applications are in chemical, paper, textile, petroleum and petrochemical industries. United States Gage Div., American Machine and Metals, Inc.

Use the Reader Service Cards provided on pages 275-276 to ask for more information on the products. Circle item numbers of products in which you are interested.

23—BUILDING PANELS are offered in four colors

Aluminum and galvanized building panels for both pre-engineered and custom construction are available in factory-applied colors. Butler-Tone, the color system utilized, is a baked-on synthetic resin type finish. After application on the unformed material, it is then shaped, punched and sheared to form insulated or non-insulated panels. Gray, tan, green and white are available on galvanized panels, and these four colors, plus cream and terra cotta, can be supplied on aluminum panels. Interior faces of

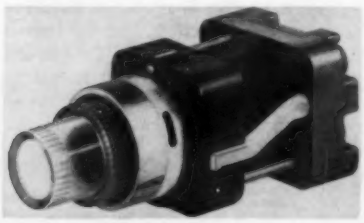
non-insulated panels are finished in off-white. Butler-Tone can be had on both of company's panels—Monopanl, which creates an entire exterior wall complete with decorative outer face, insulation and finished interior face, and Butlerib, a non-insulated corrugated panel. Butler Mfg. Co.

24—NON-SLIP SURFACE makes floors glow in the dark

An extra safety feature is available in X-L Veneer, a non-slip surface. In addition to its regular colors of red, green and gray, this topping can now be had in a luminous yellow that glows in the dark. X-L Veneer contains an abrasive filler and aggregate combined with synthetic, heavy-bodied plastic base material and solvents. It can be used over concrete, wood, steel, tile or terrazo, manufacturer points out, and in the luminous yellow, is especially suited for dark steps, ramps and depressions. The Monroe Co., Inc.

25—PUSH BUTTON features pressure connectors

This illuminated push button saves mounting space and installation time by combining in a single device both a push button and a pilot light. The



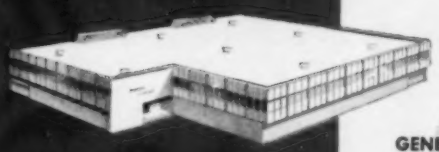
button features pressure connectors to eliminate internal wiring. Terminals are clearly marked for easy wiring. It is available with a button guard to prevent accidental operation. A range of voltage ratings and choice of six color caps provide added versatility. Contacts are rated for heavy-duty service. Bulletin 9001-T gives details. Square D Co.

26—PAINT SHEETS are pre-dried, self-adhesive

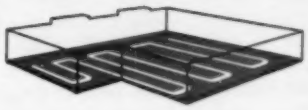
These pre-dried self-adhesive sheets of paint come in sandwich form. The paint is sealed between two layers of paper, one protecting the adhesive and the other covering the paint surface. When applying, the sheet of pre-dried paint is cut to fit the surface area. The backing is stripped off the adhesive side and the paint positioned and put down firmly. Then the surface layer of paper is removed, exposing a dry, bright painted surface. Tests are said to show that the fluores-

with

Faultless Casters You Can Utilize Production Space Efficiently . . . and Change Plant Layout as Needed!



Today, your production line can move in a serpentine pattern



. . . tomorrow it can be changed to a straight-line or circular flow

A fluid Faultless Castered production line is quickly reshaped as needed . . . to suit new products, design changes, retooling, time-and-motion study recommendations, etc. Also Faultless Castered trucks, dollies, racks, carts can transport your manufactured products outdoors for yard stocking. Whatever your production line load requirements, floor surfaces, space limitations, Faultless engineers the precision casters to meet your specific requirements and limitations.

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MEDIUM DUTY SERIES L900 CASTER

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EXTRA-HEAVY DUTY SERIES 1300 CASTER

NØELTING Faultless Casters

Faultless Caster Corp.

Evansville 7, Indiana

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50th YEAR

See Tools-Electric -Yellow Pages- for Service & Sales

Black & Decker

Quality Tool Service

NEW PRODUCTS

(Begins on page 186)

cent colors resist fading for upwards of 2 yr. According to manufacturer, this pre-dried paint has been tested on surfaces ranging from walls to airplane wings. Morgan Adhesives Co.

27—SYNTHETIC BELT designed to resist stretching

REVO is described as an improved, double-strength, all-synthetic transmission belting with "molecular memory" that makes it practically stretch-free. It is made by a method orienting nylon bands and a woven nylon cloth. A high coefficient of friction is obtained by coating the pulley side of the belt with urethane. Processing of the nylon bands sets their molecular structure permanently, it is explained, and as a result, the belt is almost 100 per cent strength-free. According to manufacturer, this belt gives under loads, but its "molecular memory" returns it to original length or tension—when properly installed it can be run indefinitely without take-up or idlers. Also, increased strength of the belt is said to permit use of thin belts at high speeds around exceptionally small pulleys. REVO has high resistance to temperatures and humidity, oils and many acids, and will accept a maximum temperature of approximately 200 F, company states. Belts can be furnished endless or made endless—in a few minutes—at the user's plant. Lapmaking machines are available to make the job easy. L. H. Shingle Co.

28—TELETYPEWRITER gives a printed and punched message

This full capacity teletypewriter, the Olivetti T2PN Printing Reperforator, is designed to produce a printed message on a standard 11/16-in. punched tape compatible with electronic readers and integrated data. In both sending and receiving messages, it prepares a conventional, perforated five-channel tape; at the same time it prints a typewritten message between the feed holes of the tape. This position of printed message offers two major advantages for data communication applications: the tapes produced are compatible with optical or electronic tape readers and they can be stored under systems now used only for uninterpreted tapes.

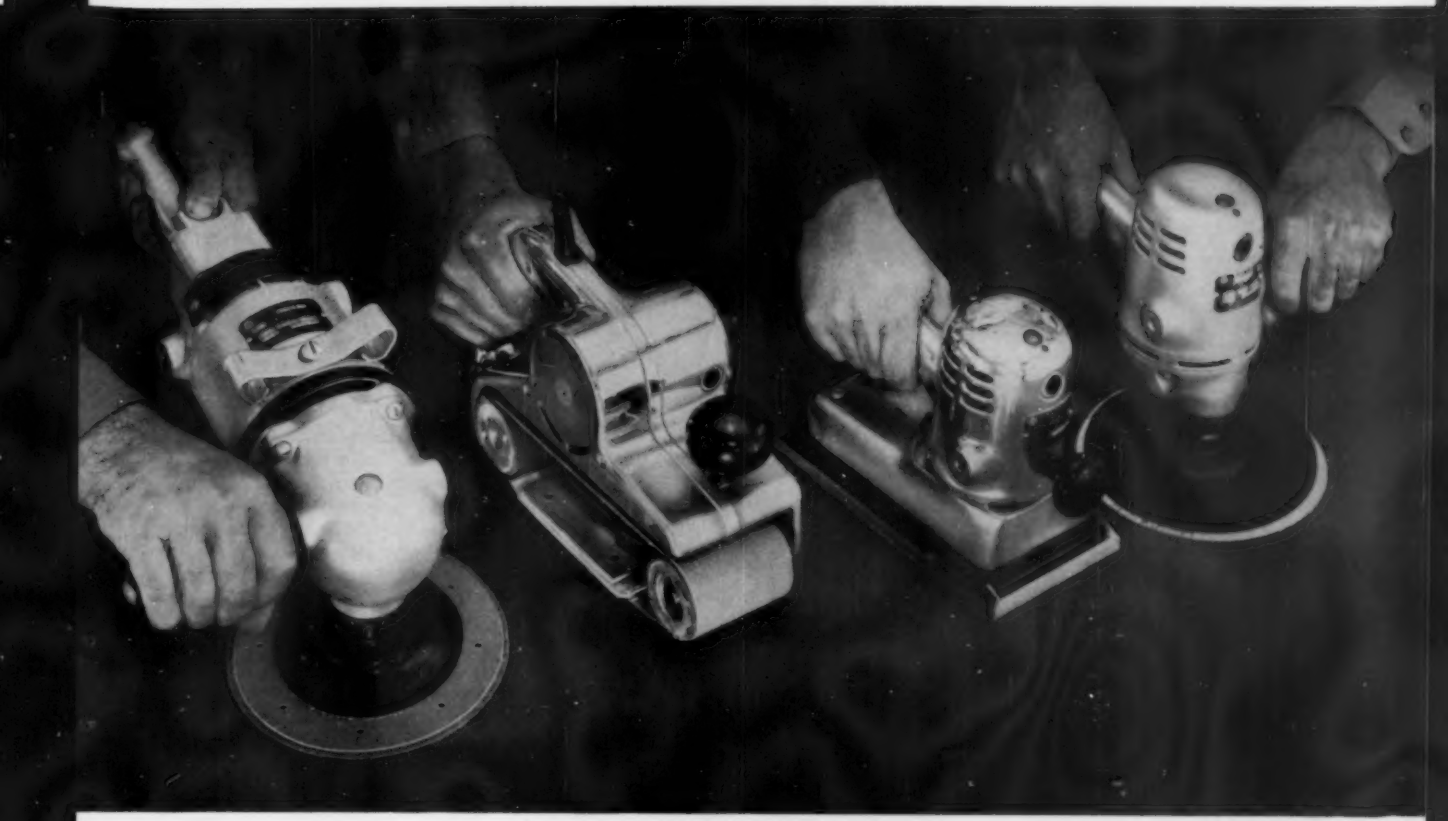
The unit is also a self-contained teletypewriter with direct keyboard action and fully compatible with existing teletypewriter circuits and machines. It can be had for 60 or 75 wpm action. Almost 20 keyboard actions are available, including four-bank configurations. The unit is about the same size and weight as an electric typewriter, about half the weight of many conventional teletypewriters. Two variations are available; an on-line machine for receiving only, and one for off-line use in tape preparation. All are available for sale or rent. The standard T2PN costs under $2000, rents for approximately $37 a month. The TELautograph Corp.

29—SAFETY SWITCH protects operator, machine

Pow-R-Off may be attached to any machine tool which uses a key-operated chuck—such as a conventional drill press. It is designed to protect both operator and machine during makeready, by locking off the flow

of electric current while the chuck key is in use. It is pointed out that with Pow-R-Off, the chuck key is always where it belongs, within easy reach. Operation is simple. The chuck key is attached, permanently, to a cable which is spring-wound on a drum; when the key is pulled out for use, a switch is tripped, shutting off the current. When the key is no longer in use, the cable is retracted onto the drum by spring action, and the switch turns the current on again. Pow-R-Off is described as an inexpensive safety device which may be installed easily in the most convenient location on the machine involved. H B Research & Development Co.

(More Products on page 202)



For any surface, rough or fine . . . look to Black & Decker's complete Sander line!

FAST FINISHING NO. 88 H.D. SANDER leaves no swirl marks for a satiny surface. Sand with, against or across the grain.

DUSTLESS BELT SANDER with unique vacuum hook-up. Sand all surfaces free from dust. Choose from six H.D. models.

HUSKY H.D. SANDER - GRINDER ideal for heavy-duty sanding or grinding jobs. 4 models to fit every type of industrial use.

NEW 7" BALL-BEARING SANDER makes sanding, brushing and polishing light and easy. 4 models, ideal for contour sanding.

For heavy-duty material removal or satin smooth surfacing, for a fast finish or dustless performance . . . there's a Black & Decker Sander just made for your job. Belt, disc or orbital design, every Black & Decker Sander is high-powered for standout service to stand up under any work load . . . well-balanced for easy handling, effortless sanding . . . fully protected against abrasive dust and dirt. B&D Disc Sanders double perfectly for grueling grinding jobs, too.

See the complete line. Clip and mail this coupon NOW . . . or call your nearby B&D Distributor.

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QUALITY ELECTRIC TOOLS

THE BLACK & DECKER MFG. CO., Dept. 0804
Towson 4, Md. (In Canada: Brockville, Ont.)

☐ Please arrange a demonstration of a B&D Sander.

☐ Please send additional information on_____

Name.....Title.....

Company.....

Address.....

City.....Zone.....State.....

☐ Drills ☐ Hammers ☐ Screwguns® ☐ Bench Grinders

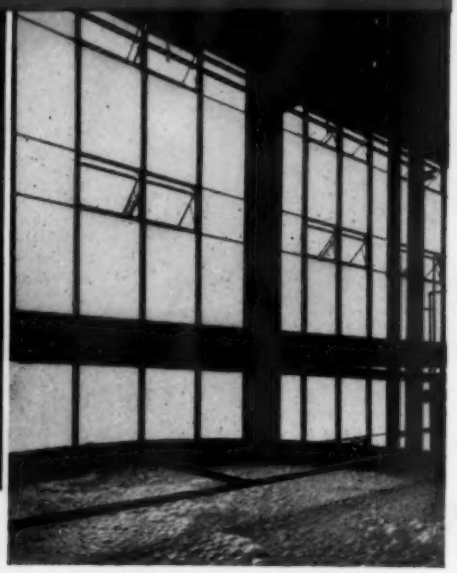
For more facts circle 600 on Reply Card

2*
DAYLIGHTING DO's and DON'Ts
FOR COMFORT-CONSCIOUS ENGINEERS

* No. 2 of a series to help Engineers increase plant efficiency and economy.

DON'T expect to eliminate the harmful effects of "raw" sunlight through ordinary glass.

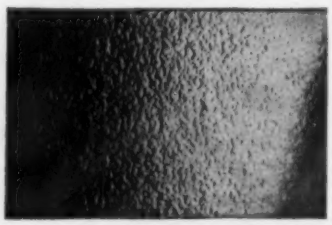
Today, most engineers realize the importance of proper factory lighting to boost efficiency and employee morale. Excess solar heat makes interiors uncomfortable . . . and blinding glare makes seeing tasks difficult and tiring.

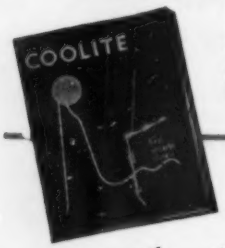


DO INSIST ON COOLITE, HEAT ABSORBING GLASS

Blue-green Coolite, glare reduced, controls the quality of light flooding work areas, helps banish objectionable glare ... cuts costly eye fatigue that results in seeing errors and reduces solar heat up to 50%! That's quite an order but Coolite can do all this because Coolite filters out the unwanted factors in raw sunlight to help keep interiors cooler, brighter, more comfortable.

Buy, specify, insist on Coolite Glass. Available wired and unwired at better distributors of quality glass everywhere.





Send for Coolite catalog. Address Department 13.

MISSISSIPPI GLASS COMPANY
88 Angelica St. • St. Louis 7, Missouri
NEW YORK • CHICAGO • FULLERTON, CALIFORNIA

WORLD'S LARGEST MANUFACTURER OF ROLLED, FIGURED AND WIRED GLASS

For more facts circle 602 on Reply Card

NEW PRODUCTS

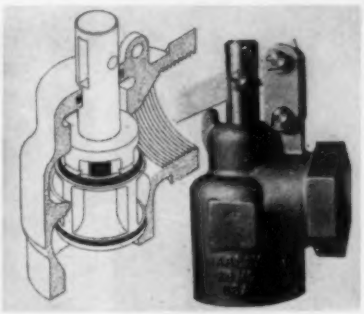
(Begins on page 186)

30—TRANSMITTER UNIT for remote temp control

Applications of this transmitter-receiver system include both heating-cooling-air conditioning and industrial processes, especially when remote control is involved. Series 200 Transmitter transduces a temperature measurement into a 3-to 15-psi air pressure from a remote location. Signal may be sent to a receiver gage which continually indicates temperature measurement. Transmitter may also serve as a sensor for remotely located receiver-controller. Operating in conjunction with transmitter, Series 200 Receiver-Controller maintains a selected temperature at a remote location. Bulletins 371, 371- 1and 371-2 give details. The Powers Regulator Co.

31—FLOAT VALVE features mechanical simplicity

This direct action float valve offers mechanical simplicity, operational de-dependability and maintenance ease, company says, and only a pair of pliers is needed for any maintenance job. It has only two basic parts—body and plug. Plug and stem are cast as an integral unit. The body, also cast as a unit, has a threaded inlet opening,



and the outlet opening can be threaded if desired. O-rings are used to form stem seal and plug seats. There are no packing glands, packing nuts, cup leathers or seat discs, no ground or threaded parts. Bulletin FV-60-1 gives details. The Marley Co.

32—STACKER TRUCK is 4000-lb capacity handler

To facilitate handling and stacking of heavier loads in intermittent duty cycle operations, this 4000-lb capacity Worksaver is a rider-walkie electric lift truck containing many design features of company's heavier duty rider-type gas and electric trucks. The mast is made of nested I-beam sec-

For more facts circle 600 on Reply Card

NEW PRODUCTS

(Begins on page 186)

tions with thick ¾-in. flanges. Interlocking design of the I-beam mast permits mounting widely spaced channel rollers parallel to the web of the beam, so that pressures are taken on the strongest roller dimension. Ten side thrust rollers, six widely spaced on the uprights and four on the fork carriage, are designed to resist any off-center loading to which truck may be subjected. The frame is a solid welded unit of heavy steel plate. Forks on this truck are adjustable from 12½ to 37½ in. in width. The Yale & Towne Mfg. Co.

Reader Service Cards on pages 275-276 make it easy to get further information on any of these products. Just circle the item numbers of the products you would like to know more about.

33—FLOOR COVERING is rugged, decorative too

Deco Tread Mastipave is a decorative version of Mastipave, in use for 30 years as a tough, long-wearing floor covering. The new product incorporates random-scattered vinyl chips—

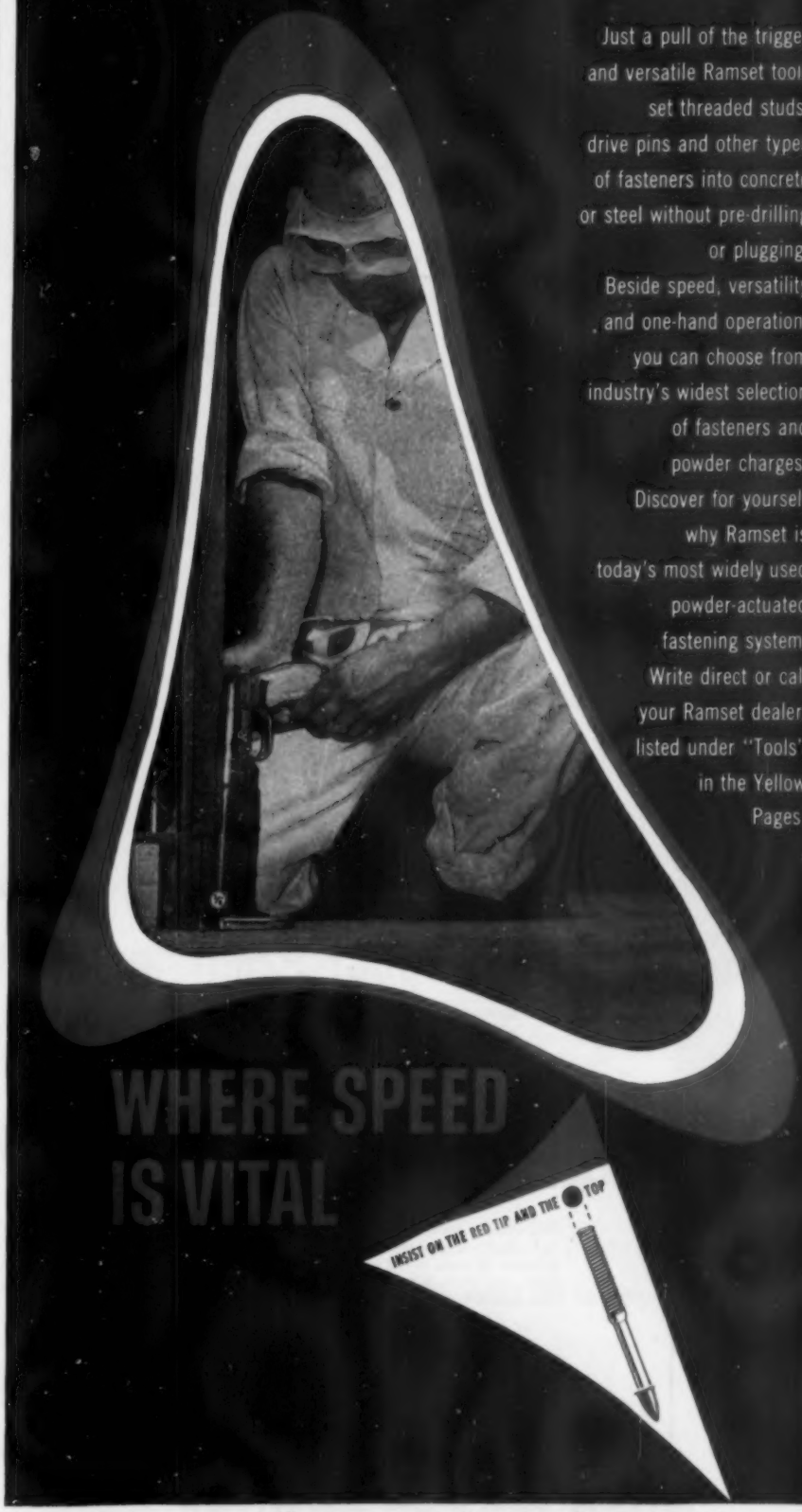
they also serve to hide trackage, scuffs and scratches. Terra cotta colored Mastipave has chips of sandalwood and beige; black Mastipave, gray and green chips. This flooring comes in rolls a yard wide by 30 yd long and in 9-by-9 in blocks. At about $1.30 a yard retail it will cost around 20 per cent more than standard Mastipave, which will continue to be available, as will Grip Tread Mastipave for potentially slippery areas. Pabco.

34—AUDIBLE SIGNAL for high-level noise area

Signal Horn PA-37100 is announced for use where coverage must be maintained over a distance and for pene-

For more facts circle 603 on Reply Card

Cost-conscious maintenance men use Ramset



Just a pull of the trigger and versatile Ramset tools set threaded studs, drive pins and other types of fasteners into concrete or steel without pre-drilling or plugging. Beside speed, versatility and one-hand operation, you can choose from industry's widest selection of fasteners and powder charges. Discover for yourself why Ramset is today's most widely used powder-actuated fastening system. Write direct or call your Ramset dealer, listed under "Tools" in the Yellow Pages.

Ramset® Fastening System

OLIN MATHIESON CHEMICAL CORP. · WINCHESTER-WESTERN DIV. · 294-D WINCHESTER AVE. · NEW HAVEN 4, CONN.

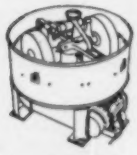
LOOKING FOR A BARGAIN —IN DRY SOLIDS MIXING EQUIPMENT?

PLEASE READ CAREFULLY BEFORE DETACHING

Many people do . . . processors who spare no expense in otherwise equipping a process with the most modern, up-to-date, time and labor saving equipment that money can buy.

Cement mixer technology*—in the space age—is time consuming, wasteful, costly and downright dangerous. It takes *more* than a simple tumbling, stirring or agitator action can *give* . . . to achieve the kind of thorough, intimate controlled dispersion that today's quality control standards *demand*. Improperly specified or "bargain" mixers will quickly take their toll in *profits* through waste, rejects, reprocessing or remixing time and expense.

The rapid increase in the use of the *Simpson Mix-Muller* has paralleled an increasing availability of more uniform raw materials. It has also paralleled a growing demand for better solids-mixing technology.



If you mix dry solids, we would like to show you how *controlled dispersion* in a Simpson Mix-Muller can help you achieve better blends of critical materials—how you can actually save valuable raw materials and in many cases *eliminate* secondary operations—by making the *most* of mixing properties. Write for our Handbook on Mulling or for details on a confidential, laboratory conducted mulling survey.

*No offense intended to concrete or "cement" mixers. You don't need a Mix-Muller to prepare concrete. Allusion is made to the too-popular conception that a mixer, any mixer, is something that goes "putty, putty." (Remember the song? "Cement mixer—putty, putty.")

DRY SOLIDS MIXING IS OUR ONLY BUSINESS . . .

SIMPSON MIX-MULLER DIVISION

NATIONAL ENGINEERING COMPANY

604 Machinery Hall Chicago 6, Illinois

P-480

For more facts circle 604 on Reply Card

NEW PRODUCTS

(Begins on page 186)

tration of high-level noise areas. The vibrating diaphram is driven by an armature producing an audio output in excess of 105 lb at 3-ft, and operates on a 60-cycle circuit. Applications include alerting personnel to danger, notifying when speed or temperature limits are exceeded, warning of operational conditions, announcing process completion in automation, and functioning as an industrial signal. Wheelock Signals, Inc.

35—PALLET RACKS have interchangeable components

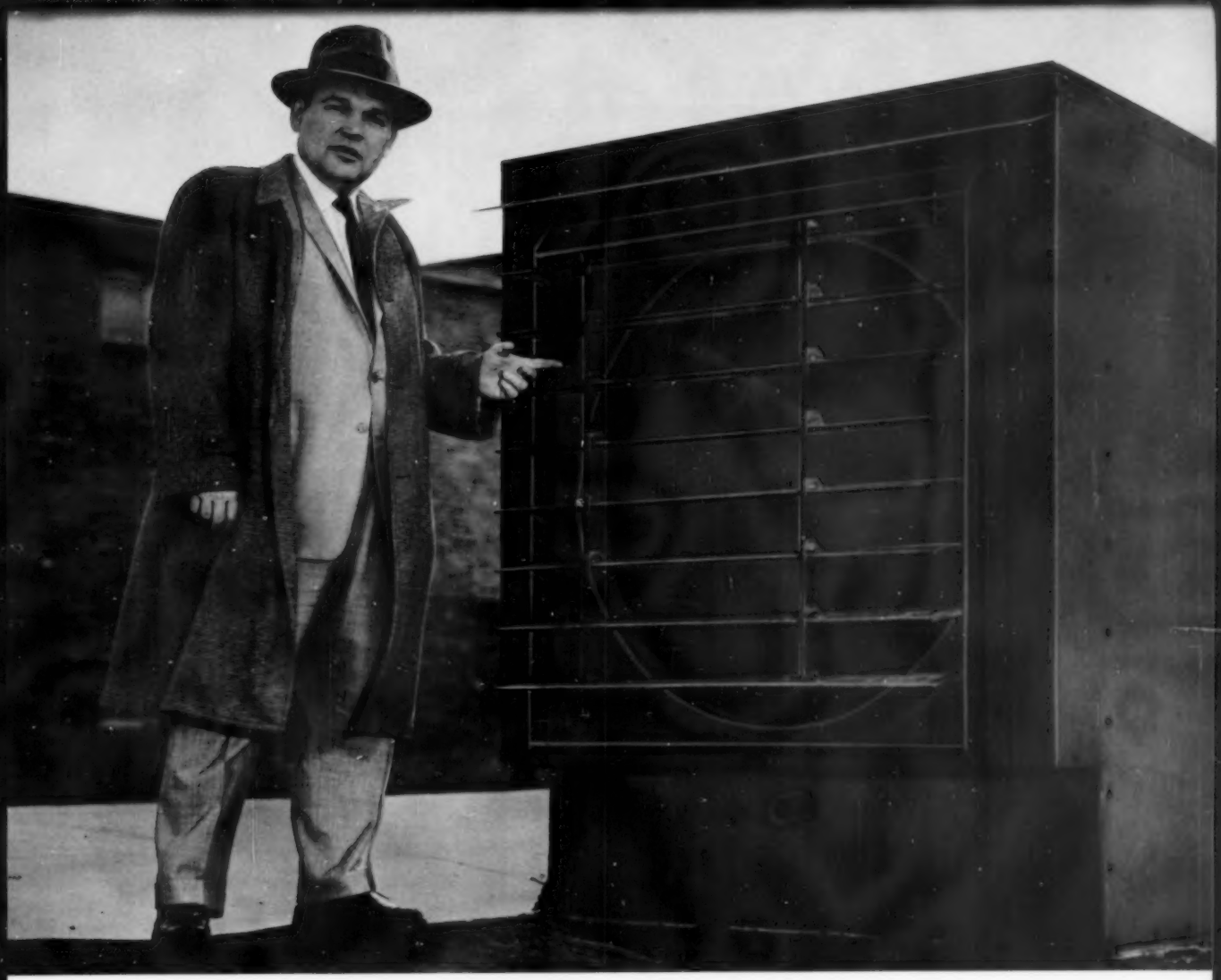
Pallet Rackers, designed to convert standard pallets into low-cost portable racks, have completely interchangeable components that can be assembled to any pallet without bolts,

nuts or screws. A lock-tight assembly bites into pallet for added security. They can be safety stacked ceiling high and handle loads up 12,000 lb per stack, company says. By use of extra support bars, each rack can be compartmentalized to handle a differentiated load. Units are stored easily; disassembled they store flat. Sturdi-Bilt Material Handling Div., Union Asbestos & Rubber Co.

36—SMALL HEATER enables low cost spray painting

For medium and small paint spraying requirements, and for small batch painting and touching up, the Beck Quart Cup Heater brings advantages of hot spray painting to limited users because of its low cost. The compact, lightweight heater is made of welded aluminum. Features announced include continuous viscosity control by automatic thermostat; accurate temperature setting of 150 F. pre-set at factory; 50 sq in., 250-w input blanket-type heating element of nichrome wire; fusible safety link to automatically cut off current to prevent overheating

For more facts circle 605 on Reply Card ——→



"We should have put in these fans the first time the 'neighbors' complained"...*Veritone Co., Chicago*

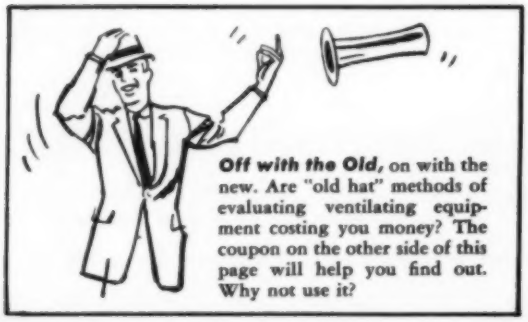
"We would have saved ourselves a lot of headaches if we had replaced our former fans with Ilg roof-mounted propeller fans *long* ago," says Russ Oliver, superintendent of Veritone Company, Chicago printer.

"We found out that 'silence is golden'—even on top of a roof. You can see that our plant is in a neighborhood full of apartments.

"Our *former* roof fans were noisy—and *so were the 'neighbors'!* They griped plenty. To get them to quiet down, we put in two Ilg propeller fans in penthouses.

"Result? It's so quiet up here now you can hear a pin drop. *And we don't hear a peep out of our 'neighbors.'*

"It would have paid us to 'replace with Ilg' fans long ago."



Off with the Old, on with the new. Are "old hat" methods of evaluating ventilating equipment costing you money? The coupon on the other side of this page will help you find out. Why not use it?

ILG ELECTRIC VENTILATING COMPANY

2832 N. Pulaski Road, Chicago 41, Illinois

Offices in more than 57 Principal Cities

Member of Air Moving and Conditioning Association Inc. (AMCA)

Want to see why ILG propeller fans are your best buy?

Follow the Flame and you'll see why Ilg direct-connected propeller fans always run "cool." Note how the vent pipe sucks in outside air to *pressure-cool* permanently lubricated Ilg-built motors, both the single-phase permanent-split capacitor and 3-phase types. At Ilg you get cost operating advantages of *open-type* motors plus the protection of *totally enclosed* types. And no motor lasts longer!

"Old Hat" Methods of evaluating ventilating equipment can cost you money. To make sure that *your* present ventilating equipment is operating to your best advantage, clip and mail the coupon below.

Put a Pilsner on any Ilg propeller fan (as we did on this 42" model), flip the switch so the fan runs at full speed, and we defy you to find any bubbles in the beer due to vibration. There *is* no vibration! Careful dynamic balancing of all component parts, and electronic checks of motor and wheels guarantee that smooth, silent operation is as much a part of every Ilg propeller fan as the "One-Name-Plate" pledge of performance that *your* Ilg fan will last through the years—*without expensive maintenance!*

Ilg Electric Ventilating Company
2832 N. Pulaski Road
Chicago 41, Illinois

Please send me your free folder "Are 'old hat' methods of buying ventilating equipment costing you money?"

Name .....

Title .....

Company Name .....

Address .....

City ..... Zone ..... State .....

ILG ELECTRIC VENTILATING COMPANY

2832 N. Pulaski Road, Chicago 41, Illinois

Offices in more than 57 Principal Cities

Member of Air Moving and Conditioning Association Inc. (AMCA)

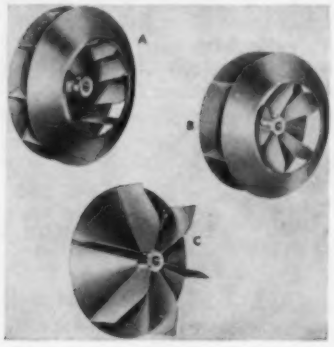
NEW PRODUCTS

(Begins on page 186)

should thermostat fail; and outside pilot light to signal operator when paint is at right heat range for spraying (about 10 min after engaging current). Dualheet, Inc.

37—INDUSTRIAL FANS have broad application

For exhausting gases and corrosive fumes and for handling of granular or fibrous materials, this line of fans includes three blade shapes, a wide range of wheel and inlet sizes and five arrangements. The fans come in AMCA standard wheel sizes from 19⅛ to 64⅜ in., with 11 inlet sizes from 11 to 37 in. Air and gas fumes



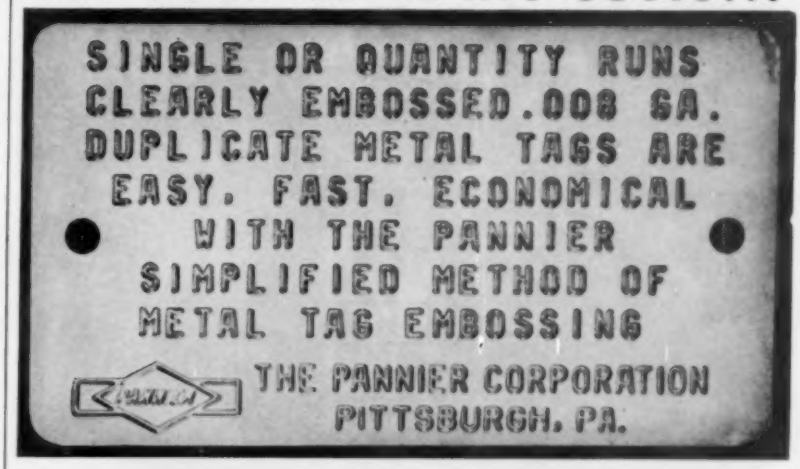
handling wheels (A, in illustration) have backwardly-inclined blades. For pneumatic conveyor systems, there is a granular materials handling wheel (B) with straight blades. To permit easy movement of stringy or fibrous materials, a straight wheel (C) without side plate is available. Housings are steel with horizontal and vertical reinforcement. The Trane Co.

38—PACKAGE PLAN films drawings economically

Film-a-Record Micro-Station Package Plan—combining camera, film, processor, Uni-Kards and reader—is being offered for around $7300, reportedly considerably less than comparable systems. It constitutes a complete industrial and engineering microfilm department, company points out, and affords savings in space, time and money while offering better protection for engineering drawings. The camera utilized is a power-driven, nine-position, planetary unit. Document sizes handled range from 15-by-21 in. at a 12-time reduction, to 36-by-47 in. at 29 times. A light meter is included. There is enough film—100-ft rolls on daylight loading spools—for 5000 documents.

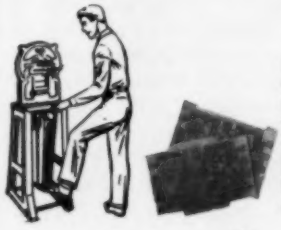
The processor is designed to auto-

CUT YOUR METAL TAG COSTS...



. . . Get clearer, sharper impressions, with PANNIER EMBOSSING MACHINES

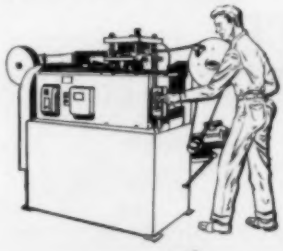
Whether you use embossed metal tags in large, production quantities—or just a few, occasional tags—Pannier simplified embossing equipment is engineered to provide your metal tags at the lowest possible cost, greatest safety and easiest readability. Inexperienced help can operate any of the machines, large or small.



One to four tags at a time (model 344)

Model 344 Pannier Embossing Machine has two uses. It can emboss up to 4 duplicate tags, like that pictured above, in sizes up to 3" x 5½" or longer, at one operation (one letter at a time).

This same machine provides the low cost, matched male and female embossing matrices (shown at left) for use with Model 207. Paired, these two machines provide complete equipment for volume tag production.



Volume Tag Production (No. 207)

The Pannier Master Marker Embossing Machine, Model No. 207-H-6 automatically produces up to 60 duplicate tags per minute, employing coils of Pannier Safety Tag stock. These tags, in strip form, are nicked and notched for easy detachment from the coiled strip. Embossing impression is made by inexpensive male and female metal matrices—that cost only a fraction of type-and-matrix methods. The machine operates by start-stop pushbutton control. Fingers never approach the embossing area.

For single, occasional tags

Pannier engineering provides a wide range of Master Marker Embossing Machines to suit any quantity requirement. This small hand-held Embosser makes individual tags on half-inch strip metals or vinyl plastic.

Pannier Embossed Tags

You can order all your tag requirements from Pannier. They're embossed for you on these same machines. Tags are low cost and delivery service is fast. They can be made to your specifications, or write for standards and price list.

Write for literature or Pannier engineering service, specifying style and quantity of tags you require.

MARKING DEVICES
THE PANNIER CORPORATION
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PANNIER MASTER MARKERS FOR QUALITY

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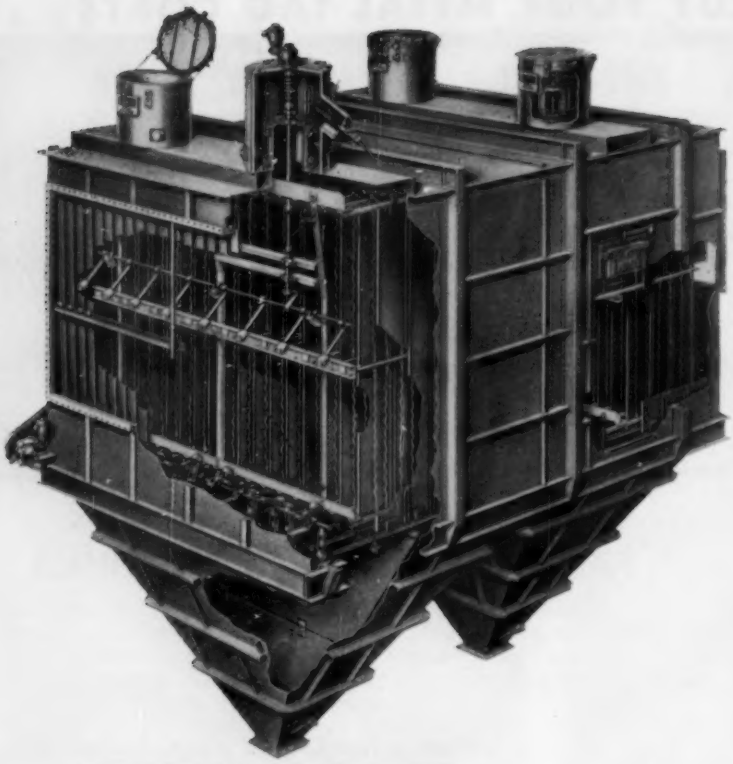
City..... Zone..... State.....



DECADE
OF OPERATION PROVES MAINTENANCE OF BUELL 'SF' PRECIPITATORS AVERAGE LESS THAN 2%

In 10 years of selling 'SF' electric precipitators, the number of replacement parts ordered from Buell has amounted to only 1.17% of the total sales! Even on emitting electrodes, usually the most vulnerable part of a precipitator, replacement has amounted to less than 1% of the original number installed. What do these extremely low percentages mean? Exceptionally low maintenance costs, for one thing, continuous high-efficiency operation, fewer shutdowns and process interruptions. Buell self-tensioned emitting Spiralectrodes eliminate vibration found in weight-tensioned wires. Buell's low maintenance precipitators will provide you with the most satisfactory operating results. They're backed by 25 years of experience in dust collection, with the practical know-how gained on hundreds of installations.

Write for descriptive literature. The Buell Engineering Co., Inc., Dept. 14-D, 123 William St., N. Y. 38, N. Y. (Northern Blower Div., 6404 Barberton Ave., Cleveland, Ohio)

buell®

EXPERTS AT DELIVERING EXTRA EFFICIENCY IN DUST RECOVERY SYSTEMS

For more facts circle 607 on Reply Card

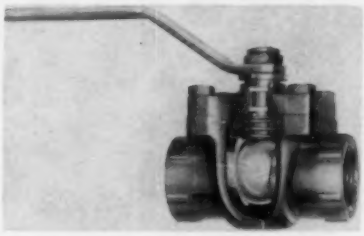
NEW PRODUCTS

(Begins on page 186)

matically develop, fix, wash and dry 16 mm, 35 mm and 70 mm film interchangeably, lengths up to 100 ft. It is designed to be loaded and operated in normal light, and with automatic controls for simple operation, to process 100 ft of film within a half hour. The Uni-Kard, an acetate jacket, enables filing and protecting of individual images—36 to the inch. Each jacket has room for direct indexing, and 5000 jackets are in the package. Form F 574 gives details. Remington Rand Div., Sperry Rand Corp.

39—BALL VALVES offer cost cutting features

Designed to reduce initial in-place cost and valve maintenance cost, the McCannaseal (shown) and the McCannaflo Ball Valves provide the full



flow of a gate valve, the tight shut-off of a globe or needle valve, company says, and the quick quarter turn of the plug valve. Valve design permits temperatures up to 350 F and pressures to 700 psi for the McCannaseal and up to 1,000 psi for the McCannaflo. They are constructed to handle practically all fluids, semi-solids, compressed gases, and compressed air. Pressure may be applied from either side, and the greater the pressure the tighter the seal. Standard body metals include stainless steel, cast steel, ductile iron, cast iron or bronze. Valve balls are chrome-plated carbon steel, bronze or stainless. Sizes range from ¼ to 6 in., screwed or flanged end connections. Hills-McCanna Co.

40—CHEMICAL CONTROL for cooling towers

For feeding balanced chemical treatment into circulating water systems of cooling towers and evaporative condensers, the Chemicator is a small, lightweight, closed reservoir through which a portion of the recirculating water flows. It is mounted on the side of the equipment, and on its upper portion a sleeve holds a weather-sealed plastic tube containing a sequence of variously formulated com-

The d-c breaker you can buy today that won't be obsolete tomorrow

Actually this new-design model FB circuit breaker from I-T-E is somewhat of a phenomenon in its field. Of all breakers available for direct current, this is the only one that really makes use of today's modern materials and up-to-date knowledge of circuit breaker design. You might say it's the only modern d-c circuit breaker on the market today.

HIGH SPEED

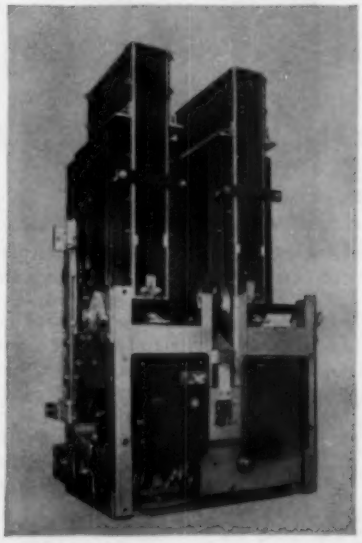
In today's high-capacity d-c circuits, you *need* a high-speed breaker. Otherwise you risk thermal or mechanical damage to equipment—such troubles as commutator flashover in rotating equipment or arc-back damage to your rectifiers. Many circuits today still have semi-high-speed breakers that don't give adequate protection. At the time they were installed they may have been the best available. Or else high-speed breakers were too expensive. That isn't true with the FB. Without paying a premium price, you get high-speed operation. Current limiting action occurs *within 6 milliseconds*. And the breaker may be safely applied to 1000 volt d-c circuits having a rate of rise of 15 million amperes per second. So the FB breaker can be used with confidence in practically all d-c circuits.

COMPACT SIZE AND LIGHT WEIGHT

Probably the most obvious difference between the new FB breaker and some of the old-design models still being sold is the greater compactness. This is one of the direct results of modern materials and technology. I-T-E engineers have given you actually superior circuit protection in less space. And the use of modern materials has shaved off many pounds of weight. Because of this they are now available in general-purpose enclosures. In addition, such new-design details as tilting arc chutes, elimination of flexible connectors, and exclusive drawout construction make this the easiest-to-maintain d-c circuit breaker you ever saw.

AVAILABLE IN 1 OR 2 POLES

If you are operating a single-wire grounded system, a single-pole circuit breaker arrangement will suffice. But suppose you are operating a 2-wire, ungrounded system. Then a 2-pole circuit breaker is desirable. And only the I-T-E model FB offers it. This is real 2-pole construction, with both poles fully integrated mechanically and electrically for simultaneous opening and closing under all conditions.



Drawout type 2-pole breaker in 6000 amp rating, electrically operated.

Stationary type single-pole FB breaker in 1200 amp rating with manual stored energy closing.

REALLY FUNCTIONAL MECHANICAL ADVANCES

Who but I-T-E would be first to give you an advance such as manual stored energy closing in a d-c circuit breaker? No slow burning of contacts with the FB. It closes in roughly 1/12 to 1/6 second for greater safety and longer contact life. You have your choice of either manual or electrical closing. The motor-operated closing mechanism draws only 5 amperes—a great advantage over the usual 50 amperes required by solenoids. Precision construction typical of I-T-E equipment, coupled with drawout design, permits complete interchangeability of breakers and parts in breakers of equal rating.

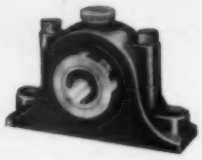
REPLACE NOW

There's questionable economy in trying to stretch out the life of old equipment that can mean costly downtime and inadequate protection. The wiser move is to replace now with new-design model FB breakers that are far ahead of the field. Models in capacities from 1200 through 12,000 amperes continuous and 1000 volts d-c. Write for the new detailed and illustrated Bulletin 4601-1A. I-T-E Circuit Breaker Company, Dept. SW, 1900 Hamilton St., Philadelphia 30, Pa.

I-T-E CIRCUIT BREAKER COMPANY

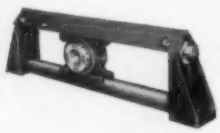
For more facts circle 608 on Reply Card

DODGE PRODUCTS you should know



DODGE PILLOW BLOCKS with TIMKEN BEARINGS
America's Quality Pillow Blocks!

TAPER-LOCK STEEL CONVEYOR PULLEYS
Maximum strength with minimum weight!



DODGE TAKE-UPS
Complete range of stock models, sizes.

•

Write for Bulletins!

- ✓ Rolling Bearings — ratings, data.
- ✓ Conveyor Pulleys — technical data.
- ✓ Take-Ups — Roller, Ball, Babbitted.

DODGE MANUFACTURING CORPORATION
2700 Union Street • Mishawaka, Indiana

DODGE
of Mishawaka, Ind.

For more facts circle 609 on Reply Card

NEW PRODUCTS

(Begins on page 186)

pressed chemical briquettes. These are made of polyphosphates and organic chelates to remove and prevent scale formation, together with automatic pH, algae and slime controls. As the briquettes are gravity-fed into the water flowing through the reservoir, they slowly dissolve and are carried into the system.

It is pointed out that the Chemicator has no moving parts yet feeds chemicals in precise amounts; the flow of the recirculating water controls the system. Chemicals are fed only when the pump is in operation, and as needed. The Chemicator sells for around $20.00 to users of company's briquettes, and an installation is said to average around $5.00. The briquettes are custom formulated and packaged in combinations to combat water problems of any geographical area. Erlen Products Co.

41—GRINDING DISC lets operator watch his work

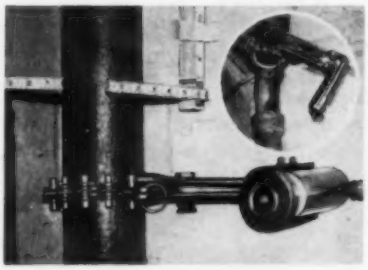
Vizi-Disc is a fiber-backed abrasive disc with two parallel straight sides, a rectangular section with a radius at each end. As such a "disc" rotates, an inch at its outer edge—the area where

grinding is done—becomes transparent. Grinding is faster because the abrasive disc need not be moved away from the work point for frequent inspection, it is pointed out, and dwell time is reduced because grinding can be confined to the exact area requiring it. Contour work and blending of welds can be done accurately, manufacturer states, and because the actual grinding is intermittent, the metal remains so cool that burning and heat distortion are practically impossible.

Vizi-Discs come in 7- and 9-in. sizes. They are surfaced with sharp-cutting Metalite, an aluminum oxide abrasive, in standard grit sizes. In use, they are supported by sisal-reinforced rubber back-up pads slightly smaller than the abrasive disc. Heavy-duty pads of the same construction are available for aggressive grinding. Pads are surfaced with a diamond grid pattern to prevent slippage. Behr-Manning Co.

42—PIPE CUTTER is hydraulic powered tool

The Wheeler Jr. Hydraulic Cutter uses hydraulic power to handle all capabilities of company's manual cutter in addition to 8-in and extra-heavy soil pipe as well as 2- and 3-in. cast iron water main. It is reported ideal for use in close quarters and on overhead installations; the heavy-duty

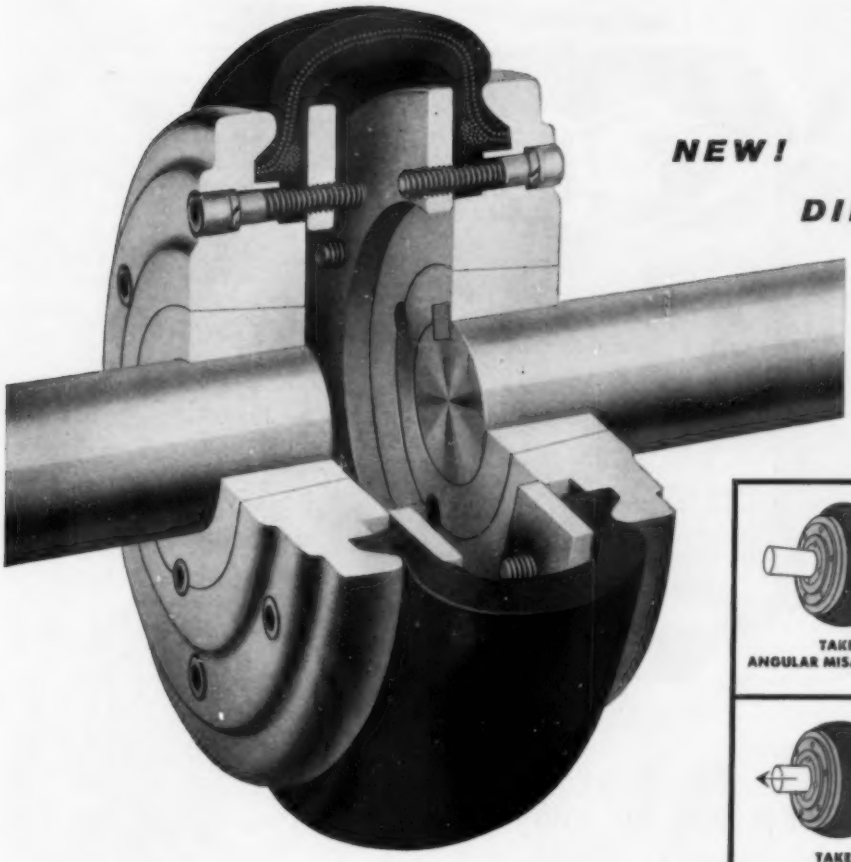


hydraulic pump may be operated remotely from the actual cutting location. The unit is dsecribed as light in weight and compact, but ruggedly built and requiring no special adjustment. The chain is simply wrapped around the pipe and the nearest chain pin engaged in the jaws. The pump is then operated until the cut is made. This cutter is supplied with enough cutting chain to accommodate 2- through 8-in. pipe. Additional chain may be added to extend its capacity up through 15-in. clay or terra-cotta pipe. Wheeler Mfg. Corp.

More information on any of these products can be yours without cost or obligation. Just circle the item numbers on the Reader Service Cards provided on pages 275-276.

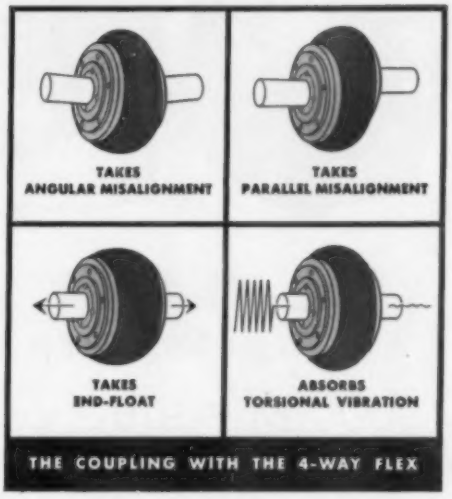
43—SAFETY DEVICE provides two control functions

Levalarm EA-100 P, a boiler safety device, is announced as combining float action and electrode-operated functions in a common water chamber. It can be used to provide fuel cut-out and low alarm. The float-action operates a switch, thrown open or closed through a magnet and armature; one or two electrodes located at the opposite end of the control serve to release fuel cut-out or actuate alarms by means of circuits isolated by transformer-relay units, company



NEW!

DIFFERENT!



DODGE

Para•flex

FLEXIBLE CUSHION COUPLING

THIS coupling "swallows up" shaft misplacements. It automatically compensates for end-float, parallel misalignment, angular misalignment *or any combination of all three.* Moreover, it cushions the stresses of shock loads. And it absorbs torsional vibration—reducing noise and protecting machinery from vibration's destructive forces.

Here is a new type of performance—made possible by the development of a tire-like flexing element. Synthetic tension members, bonded together in rubber, give this element the stamina and dependability of modern, high-speed, high-load, shock-absorbing truck tires—and the ability to respond magically to all manner of changing shaft conditions.

Para-flex takes minimum space on the shaft. Mounting is simplified through the use of standard Taper-Lock bushings—no reboring, no machining. Safety is promoted by flush design; there are no protruding parts. No lubrication is required, no periodic inspection. And since the flexible member is molded with a transverse split, it can be replaced *without moving either the driver or driven machine.*

Para-flex Couplings are stocked by Dodge Distributors in popular transmission sizes. They are available from factory stock in capacities up to 2000 hp at 1080 rpm. Call your distributor for a coupling to *make your own test.* You'll witness something revolutionary!

DODGE MANUFACTURING CORPORATION, 2700 Union, Mishawaka, Ind.

DODGE
of Mishawaka, Ind.

CALL THE TRANSMISSIONEER—your local Dodge Distributor. Factory trained by Dodge, he can give you valuable help on new, cost-saving methods. Look in the *white* pages of your telephone directory for "Dodge Transmissioneer."

For more facts circle 610 on Reply Card

You get better light . . . use less power . . . get 700% longer lamp life with

WIDE-LITE JUNIORS!

The exclusive rectangular reflector of Wide-Lite Juniors gives the broad light pattern that's unique in the lighting industry! Frequently, one Wide-Lite takes the place of three regular floodlights. Wide-Lite Juniors with color-corrected mercury vapor lamps use 61% less power. And with 700% longer lamp life, you can *depend* on them to keep vital areas well lighted!

More than DOUBLES light output!

At 250 watts, Wide-Lite Juniors with mercury vapor lamps have 10,500 lumen output as compared with 3,700 for incandescent lights . . . at 100 watts, 3,300 lumen output as compared with 1,630 for incandescent lighting. And Wide-Lite's segmented, rectangular reflector gives a broad light pattern without "hot spots" or shadows!

Find out how much better floodlighting Wide-Lites give you —send coupon today!

WIDE-LITE CORPORATION
Houston, Texas
In Canada: Wide-Lite Division of Wakefield Lighting, Limited, London, Canada

OUTDOOR AREA LIGHTS
SPORTS LIGHTS
PROTECTIVE LIGHTS
VAPOR TITE MODELS
INDOOR LUMINAIRES
MOBILE WORKING LIGHTS

WIDE-LITE

SEND FOR FREE INFORMATION . . . .
WIDE-LITE CORP., P.O. Box 191 Houston 1, Texas
Please send Wide-Lite data
(Print name, firm and address below)

For more facts circle 611 on Reply Card

NEW PRODUCTS

(Begins on page 186)

states. The device permits piping economy where two independently operated fuel cut-out devices are needed. It is reported useful on boiler working steam pressures to 350 lb or 650 psi in tank service. Details on this Levalarm are given in Catalog Section D2.5. Reliance Gauge Column Co.

44—LIMIT SWITCHES for the high speed machines

C-H Limit Switches are claimed oiltight and suggested for installations where high impacts and adverse environmental conditions are involved. Each switch is sealed to check seepage of oil, coolants, moisture and abrasive grit. External seals are at

the operating shaft bearing and between the cover plate and contact assembly. An internal seal, between operating head and switch base, provides double extra protection against entrance of liquids into the contact cavity. Enclosed but visible contacts are achieved through use of a new thermoplastic material. Switches are available in both surface and flush type mountings, are calibrated to control tolerances producing identical operation of all switches. Parts and assemblies can be interchanged from switch to switch or replaced. For further flexibility, manufacturer also offers 14 operating heads which may be mounted in any of four positions, 90 deg apart. Details are in Booklet ED 143. Culter-Hammer Inc.

45—PAINT STRIPPER for hard-to-remove coatings

Quick Strip 5 is announced as a noninflammable alkaline organic solvent type paint stripper designed to first wrinkle paint, enamel or lacquer coatings and then allow wrinkled coatings to be flushed off with water. According to manufacturer, it will strip a variety of paint coatings, including

Four-year-old Thermoid-Quaker Petrochem fire hose works under 125 lbs. pressure near Potlatch Forests' caustic operation. Exposure conditions in this area ruined ordinary fire hose in only three months.

"Petrochem" Fire Hose took 4 years of the same abuse that ruined ordinary hose in 3 months!

Mr. C. O. Bing, Fire Chief, shows original test length of Petrochem hose after four years' use.

"Petrochem" fire hose, developed by Thermoid-Quaker, has outlasted ordinary fire hose 16 to one at Potlatch Forests' pulp and paper mill, Lewiston, Idaho. Mr. C. O. Bing, Potlatch Fire Chief, says, "The conditions around our caustic operation are as tough as you'll find anywhere. Just storage in this area ruined ordinary hose in three months. Petrochem hose, without washing or refolding, is still in excellent condition after four years in this rugged atmosphere." Service like this is customary for Thermoid-Quaker Petrochem hose which is designed for the roughest, toughest treatment imaginable. Neoprene inner tube and neoprene-impregnated "Dacron" jacket give Petrochem corrosion and wear resistance to meet the severest conditions. And Petrochem is available with UL approval.

Ask your Thermoid-Quaker industrial distributor about Petrochem fire hose to meet the severest requirements of the oil and chemical industries. Or write *Thermoid Division, H. K. Porter Company, Inc., 200 Whitehead Road, Trenton 6, New Jersey.*

THERMOID DIVISION PORTER H.K. PORTER COMPANY, INC.

PORTER SERVES INDUSTRY: with Rubber and Friction Products—THERMOID DIVISION; Electrical Equipment—DELTA-STAR ELECTRIC DIVISION, NATIONAL ELECTRIC DIVISION, PEERLESS ELECTRIC DIVISION; Specialty Alloys—RIVERSIDE-ALLOY METAL DIVISION; Refractories—REFRACTORIES DIVISION; Electric Furnace Steel—CONNORS STEEL DIVISION, VULCAN-KIDD STEEL DIVISION; Fabricated Products—DISSTON DIVISION, FORGE AND FITTINGS DIVISION, LESCHEN WIRE ROPE DIVISION, MOULDINGS DIVISION, H. K. PORTER COMPANY de MEXICO, S. A.; and in Canada, Refractories, "Disston" Tools, "Federal" Wires and Cables, "Neocoduct" Systems—H. K. PORTER COMPANY (CANADA) LTD.

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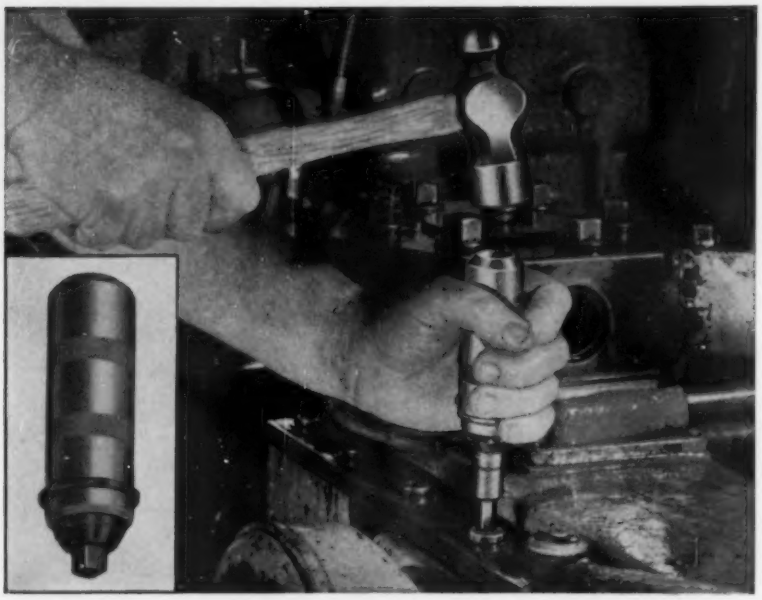


Break loose those tough, ornery ones with a Snap-on IMPAK DRIVER

★ Protects bolt or screw heads from shearing off
★ Saves time and effort

This new SNAP-ON Impak Driver is just the tool for breaking loose nuts and screws that are rusted or frozen tight.

It's simple and quick. Position socket or screwdriver bit on the nut or screw, give the Impak Driver handle a short twist to set the working cam and powerful return spring, then strike the tool head sharply with a hammer. This blow releases the spring and gives a tremendous twisting force to the blade or socket.

Extra safety to worker

Because of the sharp blow, there's less chance of screw or bolt head's twisting off when you use an Impak Driver. This not only saves time, but it means greater safety. A man pulling at a bolt can be thrown off balance if it suddenly shears off.

Driver works in both directions — can be used to tighten as well as loosen nuts or screws. Two sizes — 3/8-in. and 1/2-in. square drive. Available with sockets plus standard, Phillips and hex-head drivers. Bolt capacity up to 13/16 in.

Order an Impak Driver set now from your SNAP-ON man. It will pay for itself many times over.

FOR ALL INDUSTRY

SNAP-ON TOOLS

8068-D 28th AVENUE • KENOSHA, WISCONSIN

For more facts circle 613 on Reply Card

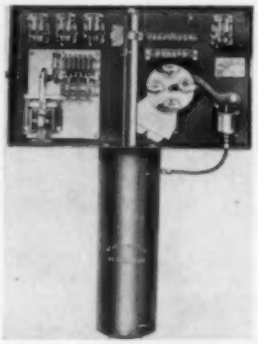
NEW PRODUCTS

(Begins on page 186)

many epoxy-resin type coatings. Solvent is used as received at room temperature, company says, and can be used in steel tanks or containers over prolonged periods without attacking metal. It is formulated to slow down evaporation of solvents and contains inhibitors so that metal surface will have nominal rust protection prior to being painted. The Mitchell-Bradford Chemical Co.

46—FAIL SAFE CONTROL protects pressure tanks

This fail-safe control for hydro-pneumatic pressure tanks is designed to eliminate danger of tank becoming over charged with air on quick drop in water level or on failure of the float to operate. The control circuit



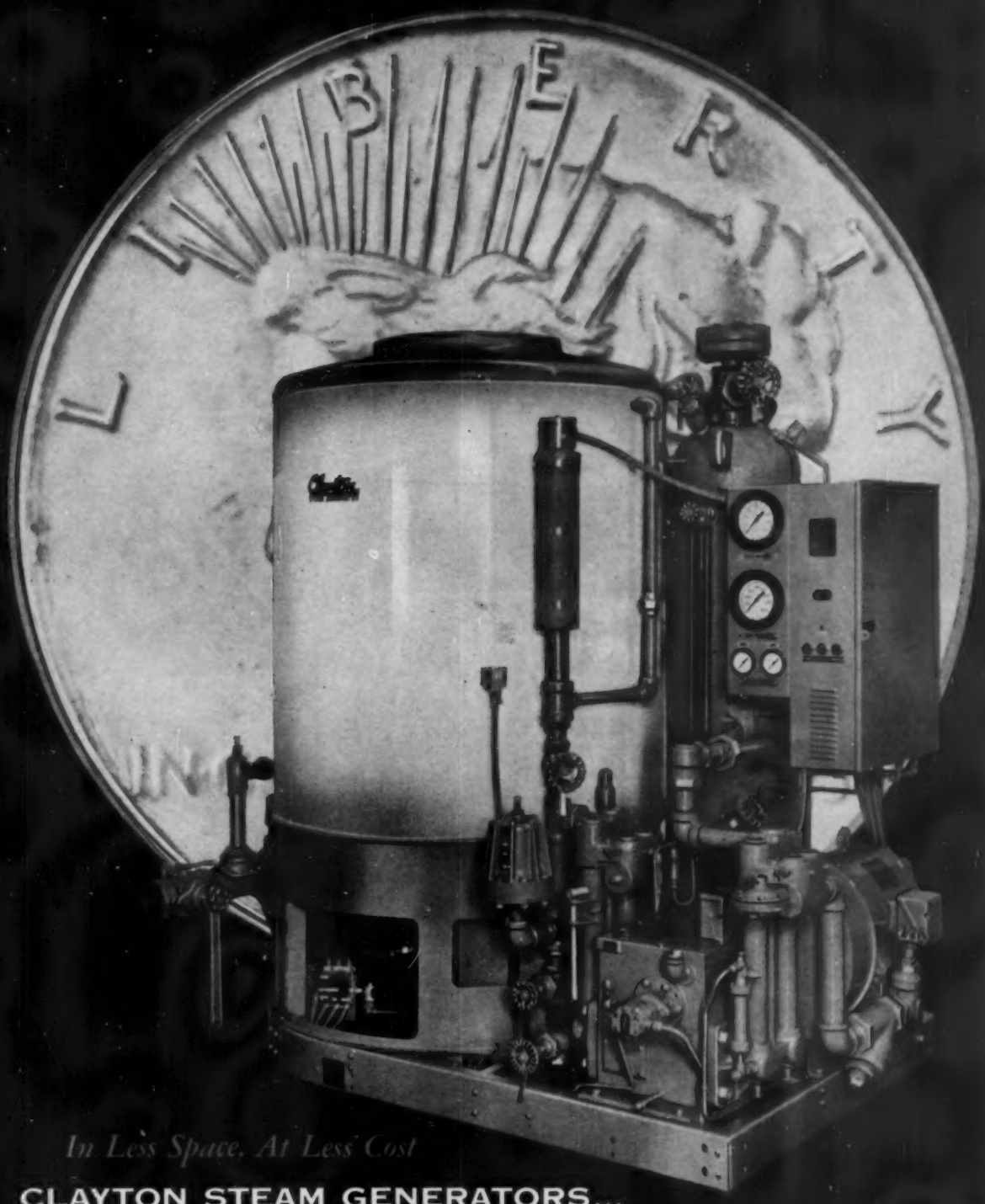
shuts off pumps on either high water level or high pressure. A high-flux ceramic magnet and magnetic linkages are used between float and limit switch. Both air pressure and water level in tank are regulated automatically. Correct air-to-water ratio is maintained by automatically operating the pumps to add water and the air circuit to add or release air as necessary. Illustration shows a three-pump unit with three-pump automatic alternator. Control is available for any number of pumps; and in air add type for use with centrifugal pumps, or in air release type, for use with deep well pumps. Healy-Ruff Co.

47—VERTICAL DRIVE for variable speed pumping

Manufactured in five sizes, the vertical Ampli-Speed can provide variable pumping speeds over a range from 0-1740 rpm. With variable speed pumping through drive, pump speeds can be exactly matched to flow demands, company points out. A variety of sensing controls can be used to make pump operation completely automatic. Units have a built in speed

For more facts circle 614 on Reply Card →

STEAM THE MODERN WAY



In Less Space, At Less Cost

CLAYTON STEAM GENERATORS...

SAVE SPACE AND INSTALLATION COSTS—Only a fraction the size and weight of ordinary boilers. Models from 16½ to 175 HP. All sizes 65 to 195 psi. Larger sizes 15-295 psi.

SAVE ON STEAM—You pay only for the steam you use. Steam in 3 minutes or less from cold start—no standby loss.

SAVE ON OPERATING COSTS—Cut fuel costs up to 50%, save labor, maintenance and time.

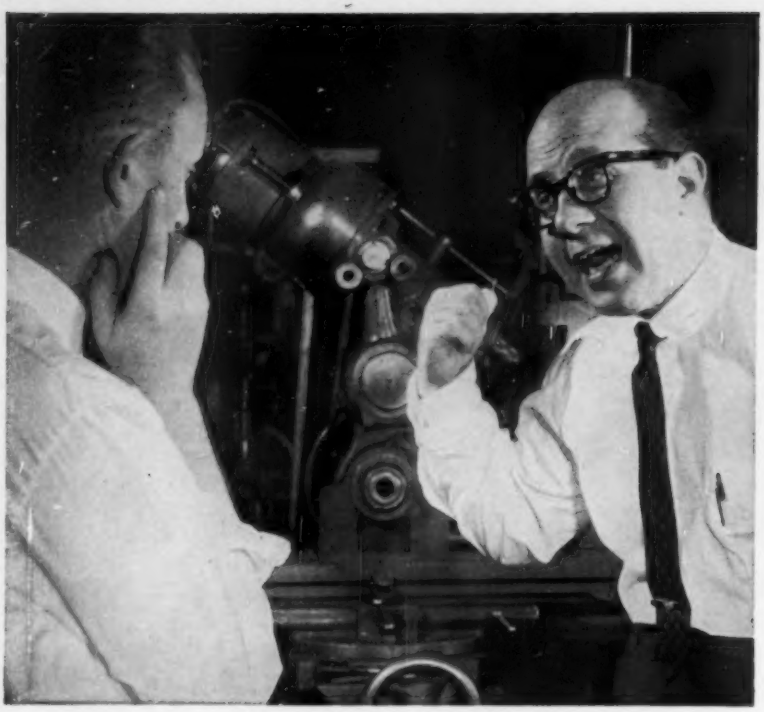
Write today for more complete information.

Clayton

416 MANUFACTURING COMPANY

EL MONTE, CALIFORNIA • CINCINNATI, OHIO

TORIT DUST COLLECTION ENDS THIS:



"OUT OF PRODUCTION FOR THREE DAYS? THAT'S WHEN WE'RE SUPPOSED TO SHIP!"

"And believe me, that wasn't all the boss said! Two key machines were so clogged with dirt and grime we had to disassemble and clean them—overnight! Between overtime for the repair crew and our own crew, I managed a partial shipment in three days. And I made up my mind this wasn't going to happen again!

"I'd heard of preventive maintenance with Torit Dust Control equipment—and the Torit representative I called sure opened my eyes! Clean machines hold close tolerances better and up to 80% longer! Torit collectors remove over 99% of dust and air-borne debris, save on both the cost and frequency of servicing.

"I expected there'd be a hitch on prices—but look what I found out: our production breakdown cost nearly as much as the Torit equipment we needed! And just while Torit Dust Collectors are being depreciated we'll make money on them —through maintenance savings, improved production, and reduced down-time!

"The boss actually congratulated me when I showed him the savings Torit preventive maintenance gives us!"

Torit Dust Collectors stop dust build-up before it costs you money. They're available in both high efficiency cyclone and cabinet type units. Why not check into them today—write:

TORIT manufacturing company

Dept. 1820, 1133 Rankin Street, St. Paul 16, Minnesota

For more facts circle 615 on Reply Card

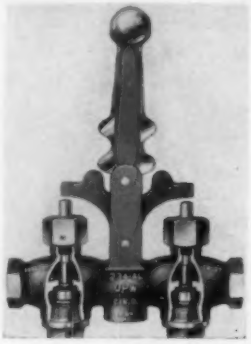
NEW PRODUCTS

(Begins on page 186)

control circuit which holds a pre-set drive speed to within ± 2 per cent. It is built to match most vertical induction motors or built integrally with induction motor. PRD-263 gives details. Electric Machinery Mfg. Co.

48—CONTROL VALVE for air or hydraulic machines

The No. 234-AL is announced as an aluminum body air control valve for use with any air or hydraulically operated machine. When valve lever is moved to right, operation of machine is forward. When lever is moved to



left, operation is rearward. With lever in center position, machine is inoperative. This allows single valve to control forward and rearward motion as well as stopping air or hydraulically operated machinery. Valve has hold-open feature for locking lever in either forward or reverse position. It is designed to close automatically when operator releases lever. Features include spring loaded poppets for tight shut-off, oversized stems to resist bending and give tight seal between packing and stem, and raised seats with in line disc contact. Bulletin F-44-RE gives details. OPW-Jordan Corp.

49—NEOPRENE PAINT protects metal, wood, concrete

APCO Liquid Rubber Paint is a liquid Neoprene paint applied by brush or spray to metal, wood, plastic, concrete and other surfaces to form a protective coating. It is described as a permanently-flexible, self-vulcanizing paint that will not peel; blister or crack under changing climatic conditions, is impervious to water, oils, gasoline, naphtha, acids, alkalies, and most solvents; and resists rust, mildew and fungus. Suggested uses include painting metal railings, fences, waterproofing chimney flashings, protecting drains and ducts, repairing

You can't equal HALLOWELL

for built-to-order convenience in standard units

basic open bench

with single drawer

with top shelf, backboard, end pieces, single drawer, tie bars

with two 2-drawer units

with two shelves, single drawer

with backboard, end pieces and three single drawers

with top shelf, backboard, end pieces, two 2-drawer units, footrest

with top shelf, two 3-drawer units

with three shelves

back to back, single drawers, common top shelf

with two 3-drawer units, footrest

with laminated wood top, electrical panel.

Only Hallowell offers such a variety of lengths, widths, tops, heights, and so many accessories. Best of all, rugged Hallowell units can be tailored to your needs *immediately*, from stock! Specify Hallowell Benches for complete adaptability now . . . and for years to come.

Mail coupon today for FREE Catalog

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where reliability replaces probability

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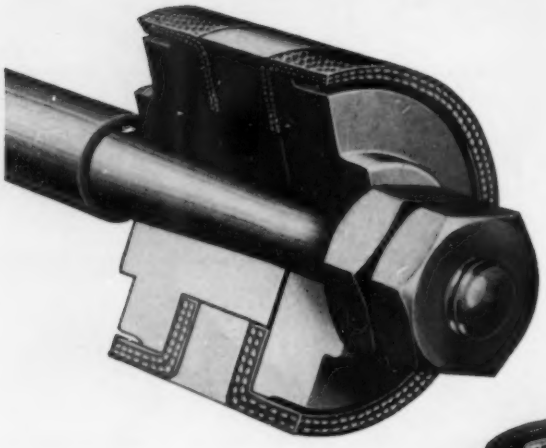
LESS FLUID SLIPPAGE!
LESS DOWNTIME!
GREATER EFFICIENCY!



...in hydraulic and pneumatic mechanisms, reciprocating pumps

Darcova Pumcup

Darcova 45° Bevel Type Pumcup

THE BIG DIFFERENCE you'll find in Darcova Pumcups is that they operate at full efficiency *throughout their entire life.* This means fluid slippage is virtually eliminated.

And because fewer replacements are necessary, you have less downtime. Users report that Pumcups *outlast ordinary packings at least 3 to 1!*

Pumcups are available in three textures—hard, medium and soft. Also in regular or 100% nylon composition. Sizes range from ¾" to 20". For all the facts on Pumcups, write for Bulletin 5903.

DARLING VALVE & MANUFACTURING CO.
Williamsport 14, Pa.

DARCOVA — THE ORIGINAL COMPOSITION CUP

TRADE MARK PUMCUPS

For more facts circle 617 on Reply Card

NEW PRODUCTS

(Begins on page 186)

leaking pipe joints, cementing loose tiles, insulating and rust proofing air conditioners. Adhesive Products Corp.

50—INGOT GRAB for handling metal slabs

Style 1692 Ingot Grab is designed for handling aluminum slabs, stacking them on a conveyor for transport to annealing furnace. Slabs are picked up in the long dimension and held by

gripping points on legs of grab. Jaws slide down on its legs and ingot may be rotated 90 deg from a horizontal position, or it may be picked up on one side or another and rotated 90 deg. Company points out that grab is automatic, alternately gripping and releasing load, and no man is needed when placing slab at rest except to guide it into desired position. Grab is also used to and from scalpers. Mansaver Industries, Inc.

It's easy to obtain product data with the postage-free Reader Service Cards provided on pages 275-276. Use them for information on advertised products, too. Just circle the key number appearing at bottom of the ad.

51—VOLTAGE RECORDER is narrow-range instrument

For plants requiring close, accurate a-c voltage checks, this instrument is designed to provide a continuous record of fluctuations between 110 and 130 v on a 10-¾ in. calibrated scale and strip-chart. Accuracy is given as + 0.25 per cent of mid-scale voltage. In operation, the recorder uses the stable voltage characteristics of a silicon diode to compare forward and reverse half-cycles of the input voltage. This produces average d-c voltage proportional to the input RMS voltage, which is then measured

THE MARK OF SORGEL

DRY-TYPE TRANSFORMERS • SPECIAL TRANSFORMERS
SORGEL ELECTRIC CO.
QUIET QUALITY
MILWAUKEE, WISCONSIN
INDOOR UNIT SUBSTATIONS • D. C. SATURABLE REACTORS

your guarantee of the preferred

DRY-TYPE TRANSFORMERS

Look for this gold seal on dry-type transformers. It is the true mark of creative engineering and manufacturing craftsmanship. It represents the choice of a Consulting Engineer who specified the best; a Plant Engineer who wanted to be assured of dependability, rugged construction, high efficiency, a full-rated load operating continuously at a safe temperature; a Wholesaler who recommended for performance first; a Contractor who insisted on guaranteed delivery, installation ease, versatility of application, plus a competitive price; and a satisfied customer who is enjoying the great operating economies found only in Sorgel's expertly designed, carefully constructed, sound-rated, dry-type transformers. Complete engineering data and design services are available from your experienced, local Sorgel Sales Engineer, or from Sorgel's sales headquarters in Milwaukee.

Complete Line for Every Purpose up to 10,000 Kva, up to 15,000 Volts, Including Special Transformers and Saturable Reactors

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...discriminating buyers choose

FEEDRAIL

Crane & Hoist Electrification Systems

1. **Electrical Safety**—Heavy gauge steel housing encloses copper bus bars, track-supported trolleys with positive polarization and uniform contact pressure, and every other provision making an electrical system safe and fool-proof is incorporated.

2. **Personnel Safety**—Metal enclosure protects plant and maintenance personnel. No dangerous bar conductors and accident-causing broken wires, trailing or strung cables.

3. **Dependability** – Rugged, precise construction, pays dividends in power continuity and maintenance—keeps cranes and hoists rolling!

4. **Adaptability**—Prefabricated runs may be of any length, straight or curved, with turntables, slide or tongue switches. Readily adaptable to suit changed conditions, every part re-usable.

5. **Compactness**—Single metal housing occupies less than half the space of open conductors or sheathed bars. Looks neat, too!

6. **Easy Maintenance**—Replacement of parts is negligible. Any part can be replaced without interfering with the rest of the installation.

7. **Life-Time Use**—Never becomes obsolete! Assures power for the life of the crane or hoist. Outlasts other types of electrification.

8. **Low Installation Cost**—Nothing left to do on the job site but to connect units together—fast—because everything has been engineered to fit installation requirements. No special tools!

Information for you: Bulletins are available on Feedrail 60 Ampere Systems (90 Ampere Intermittent Service); 100 Ampere Systems (150 Ampere Intermittent Service); and Heavy Duty Systems of 225, 375 and 500 Amperes. See your local Electrical Distributor or write Feedrail, Department P-4.

Never Becomes Obsolete

ELECTRIC FEEDRAIL

FEEDRAIL CORPORATION

Subsidiary of Russell & Stoll Company, Inc.

125 BARCLAY STREET • NEW YORK 7, N.Y.

SPECIALLY QUALIFIED REPRESENTATIVES IN PRINCIPAL CITIES

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NEW PRODUCTS

(Begins on page 186)

using a potentiometric null-balance recorder mechanism.

The recorder is available for both 50-and 60-cycle systems. Chart speeds range from ½ to 360 in. per hour; response time from 1 to 24 sec. can be had. Ease of maintenance is aided by a hinged mechanism panel that swings out to allow access to components within the instrument. Components are isolated by function. Recorder is adaptable for surface or semi-flush mounting. It is 17-11/16 in. wide, 16-3/16 in. high, 17-1/16 in. deep. General Electric Co.

52—SAFETY VALVES can be locked with padlock

Locking feature on these sliding sleeve valves performs two functions. It serves to eliminate work on air-operated machines with live air in the system. The three-way version exhausts "down stream" air when in

the "off and exhaust" position. Also, it is designed to prevent loss of a machine's air pressure at the wrong time. And it conserves air during long shutdowns. Valves can be locked in both "off and exhaust" and "on and flow" positions with or without exhaust shield. Manufacturer suggests their use as standard equipment on main inlet header of machines utilizing compressed air. They are available in two- and three-way actions, manually or spring returned, tap sizes of ⅛ through 1 in. Hunt Valve Co.

53—FLUID HEATER increases temperature fast

The Spee-Flo Pressurematic, a fluid heater, is designed to raise the temperature of a pint of fluid per minute to 170 F. It is described as simple in construction and having no moving parts. The heating element, cast into the unit, is thermostatically controlled, and equipped with a safety fuse to

STEAM

AIR

OIL

WATER

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direct acting

piloted piston

if it flows...

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Oil, gas, water, steam, corrosive fluids, refrigerants—makes no difference what you're handling... General Controls has a solenoid valve to do the job. The General Controls line is *complete*... pressure range from 0 to 3000 psi in normally open, normally closed, shut-off, 3-way and 4-way valves.

And this *single reliable source* can save you time and money... by delivering a quality product—backed by factory-trained field service representatives where and when you need them. Call on the man from General Controls for help in solving your automatic control problems.

Nine plants... 44 factory branch offices at *your* service.

diaphragm

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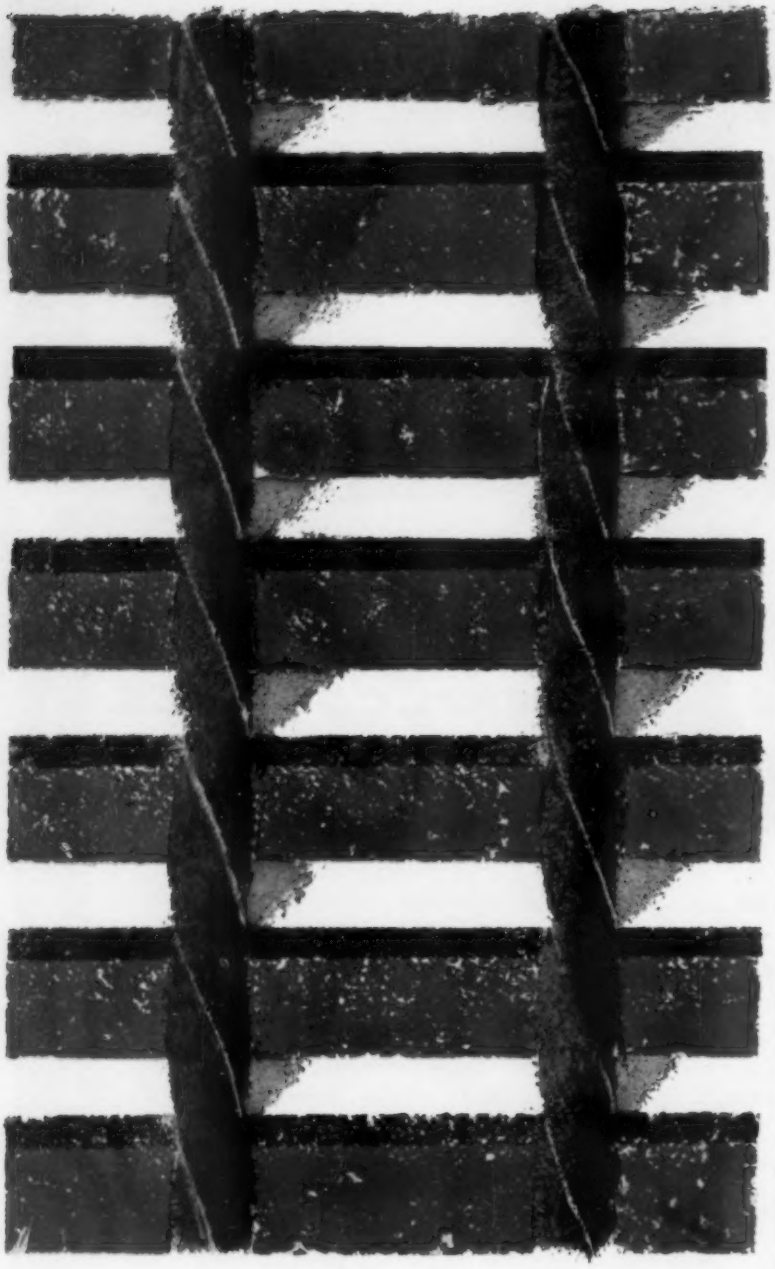
Circle Index Number Below on Reader-Service Card for Complete New INDUSTRIAL CONTROLS CATALOG

For more facts circle 620 on Reply Card



Blaw-Knox Electroforged Grating solves so many problems for so many industries. Catalog free on request. Write

Blaw-Knox Equipment Division, Pittsburgh 38, Pennsylvania.

BLAW-KNOX

GRATING

For more facts circle 621 on Reply Card

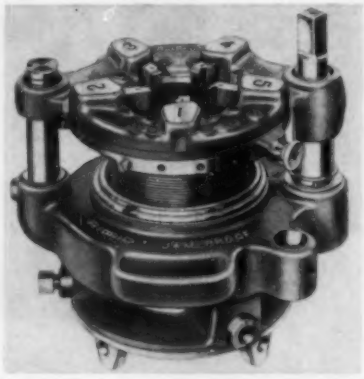
NEW PRODUCTS

(Begins on page 186)

melt and break the circuit if the thermostat fails to function properly. It is announced as UL approved as an explosion-proof device for operation in hazardous locations. The heater is simple to operate, easy to clean, and comes in types for direct flow or constant recirculation. The Spee-Flo Co.

54—THREADER cuts without changing dies

Now 3½- to 4-in. pipe and conduit can be threaded without changing dies, it is announced, with the Ridgid 141 Jam-Proof Geared Threader. Just one



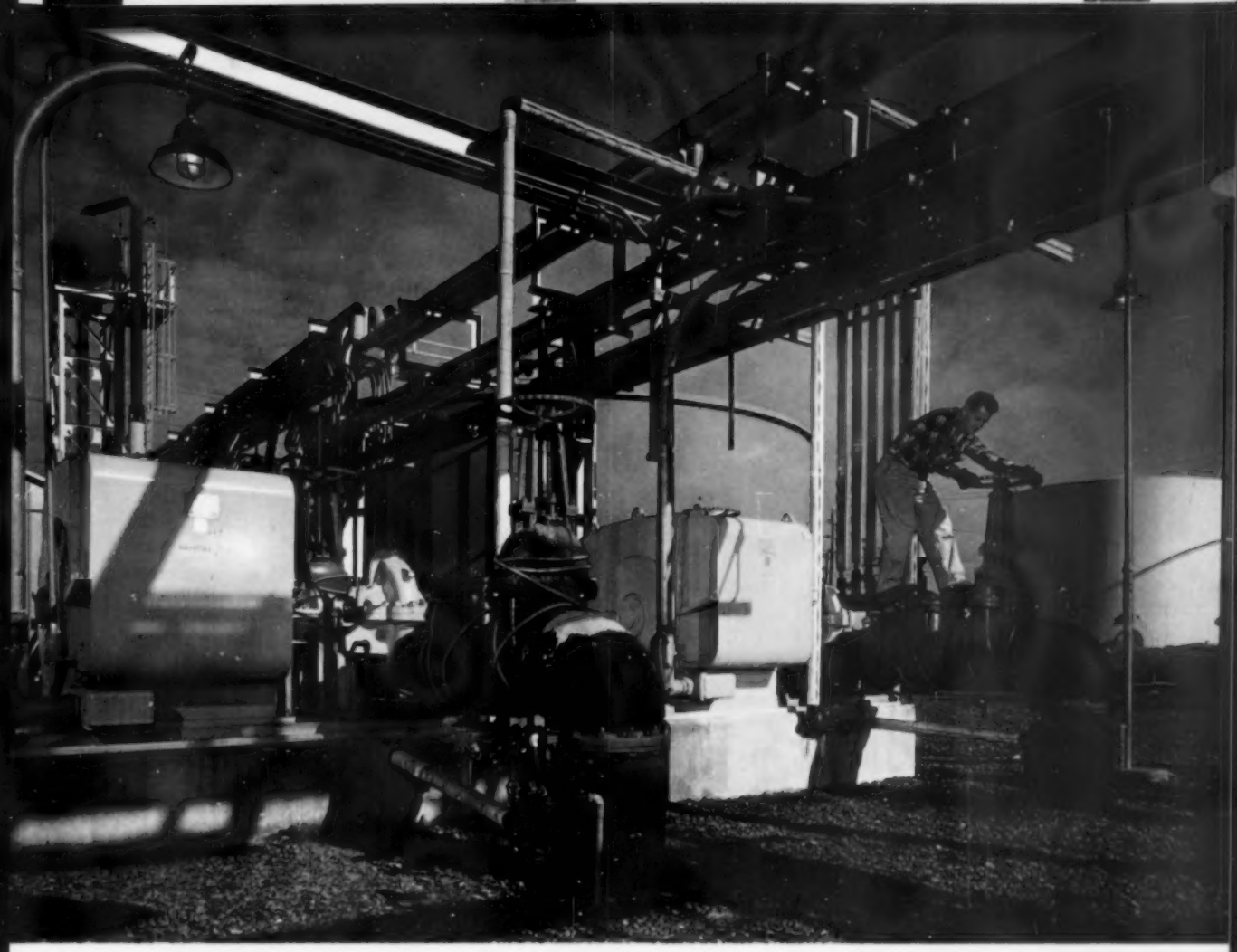
set of dies threads 2½, 3, 3½ and 4 in., company says, and threader adjusts for straight or tapered, over and under size threads. Drive pinion of the jam-proof threader kicks out automatically. Cam-action workholder sets exactly to size by easy turning of collar. The Ridge Tool Co.

55—POCKET RECEIVER is extra high powered unit

Reliable voice communication even in noisy locations is claimed for this transistorized VHF Handie-Talkie Pocket Receiver. It provides 500 milliwatts audio output—five times the power of previous units, says manufacturer, and it is available for operation in the 25-54 megacycle and 144-174 megacycle frequency bands, standard two-way mobile radio channels. It weighs just over 10 oz, can be worn in pocket or clipped to belt. Both volume and squelch can be controlled externally. It operates from a battery or from mercury cells. The rechargeable nickel cadmium supply provides up to 12½ hr per charge, and the rechargeable mercury cells last up to 125 hr. Two types of nickel cadmium battery chargers are available: one for charging batteries

For more facts circle 622 on Reply Card ——→

For more facts circle 820 on Reply Card



CONTROL CORROSION

Severe weathering, critical chemical exposures even at elevated temperatures, and many other corrosion problems can be controlled by a Truscon system specifically engineered for the job. Maximum protection at the lowest cost per square foot per year is the prime consideration of every Truscon recommendation.

When you consult Truscon you get a written specification for proper surface preparation and painting, plus assistance in application and inspection methods. Interior or exterior surfaces, metal or concrete, machinery, buildings, bridges, or tanks, can all be protected by a Truscon coating system. Call the branch nearest you or write Truscon Laboratories for specific information.

TRUSCON *Laboratories*

Industrial Maintenance Division of
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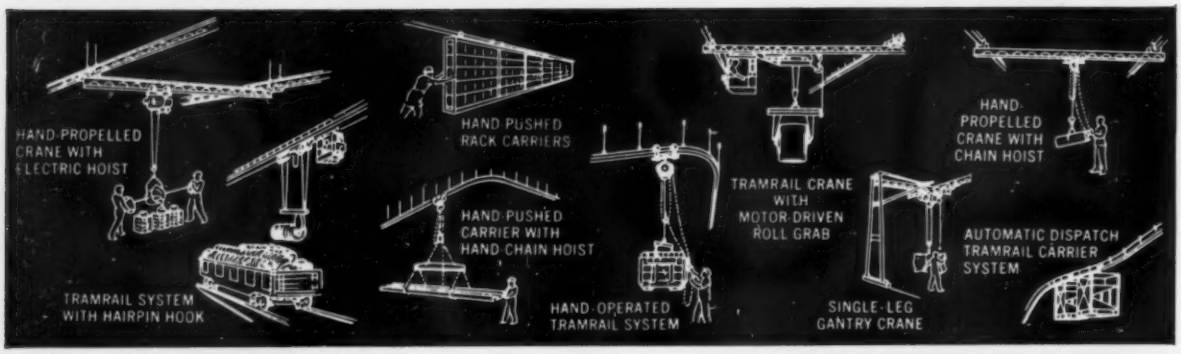
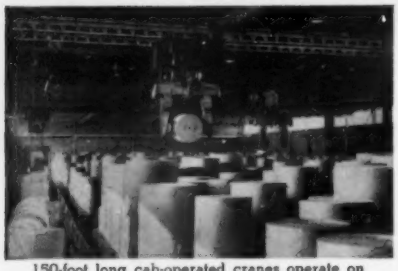
CLEVELAND TRAMRAIL *Serves* EVERY INDUSTRY


HAND-PROPELLED CRANE WITH ELECTRIC HOIST
HAND-PUSHED RACK CARRIERS
HAND-PROPELLED CRANE WITH CHAIN HOIST
TRAMRAIL CRANE WITH MOTOR-DRIVEN ROLL GRAB
HAND-PUSHED CARRIER WITH HAND-CHAIN HOIST
AUTOMATIC DISPATCH TRAMRAIL CARRIER SYSTEM
TRAMRAIL SYSTEM WITH HAIRPIN HOOK
HAND-OPERATED TRAMRAIL SYSTEM
SINGLE-LEG GANTRY CRANE



150-foot long cab-operated cranes operate on 5-track runways. Power-operated grabs handle and turn rolls.

TRIED AND PROVEN COST-CUTTING EQUIPMENT

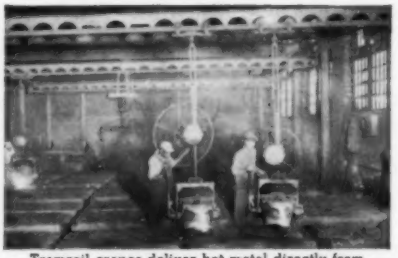
The variety of ways in which Cleveland Tramrail is serving industry is amazing. It delivers materials from storage or car or truck, directly to point of work without re-handling—transports delicate, fragile wares without damage—moves hot molten metals safely—carries materials between distant points on the same or different floors or buildings. It speeds production, improves plant efficiency and cuts costs. Regardless of size or type, most installations pay for themselves in one year and keep on paying goodly dividends years after year thereafter.

Cab-operated tractor hauls brick mixes at low cost in bottom-dump buckets from mixers to press hoppers.

Heavy textile beams handled easily by one man with hand-propelled crane. No floor interference. Closer loom spacing.

STANDARD ITEMS EASILY COMBINED TO HANDLE MATERIALS OF ANY KIND

Cleveland Tramrail consists of track, switches, carriers, cranes, hoists, grabs, etc., which can be combined in a thousandfold ways to serve nearly every need. Equipment can be made in all variations from simple hand or electric floor-operated, to cab-controlled and automatic plant-wide systems.



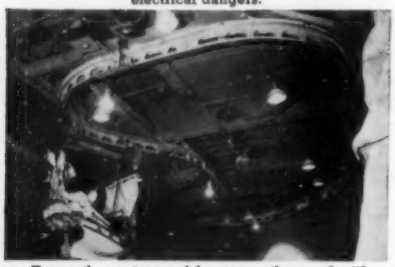
Tramrail cranes deliver hot metal directly from furnaces to molds in fastest time. Speed production. Aid safety.

Heavy batteries are easily handled with manually-propelled cranes and electric hoists. SAFPOWRBAR® ELECTRIFICATION minimizes electrical dangers.

50,000 INSTALLATIONS

Over 10,000 customers have purchased 50,000 installations of Cleveland Tramrail and many of these are still in continuous operation after 25 or more years of service.

Heavy castings machined on planer are carefully inched into place with smooth working Tramrail crane.



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For more facts circle 623 on Reply Card

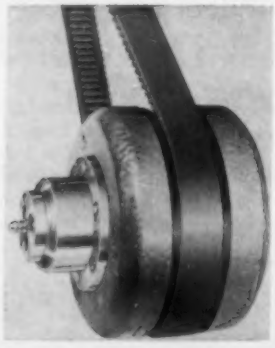
NEW PRODUCTS

(Begins on page 186)

removed from the receiver case, the other is a rack into which the complete receiver is slipped. Included in the unit is a built-in antenna. Communications and Industrial Electronics Div., Motorola Inc.

56—PULLEYS, variable speed, utilize V-belts

Recent additions to this company's line of cam-operated pulleys are five variable speed units, including adjustable motor bases, V-belts and V-belt sheaves. They utilize economical narrow V-belts, provide speed ratios to 3 to 1, and are rated for motors of 1, 1½, 2, 3 and 5 hp at 1750 rpm, and for ¾- to 3¼-hp motors at 1150 rpm. Use of narrow



V-belts on the pulleys, from ⅞ to 1 7/16 in. top widths, helps reduce operating costs on drives of this range. They are suggested for use where economy is a factor, and can be installed on new or old equipment to provide instantaneous speed changes with finger-tip pressure while machine is running. Depending on pulley model standard bore sizes are ⅝, ¾, ⅞, 1 and 1⅛ in. with bore lengths from 2½ to 3⅝ in., motor travel for full speed range, 3⅛ to 4 in.

Manufacturer points out that the cam and cam follower assembly behind each pulley face means constant speed even under overload conditions, no compression of belt because springs are not used for driving members, automatic belt tensioning to match the load, and constant belt alignment. Hi-Lo Mfg. Co.

57—TEMP REGULATOR for severe conditions

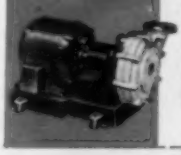
Design especially for use on gas-fired petroleum heaters and treaters, this self-powered temperature regulator is said to withstand severe service conditions with minimum maintenance.

Life in these excited states...

"I don't care if it does do the trick in your attic!"

KEN BOYER

"WAM" PUMP finest you can buy



Highest pumping efficiency, with faultless corrosion resistance. Hard rubber casing and impeller; Hastelloy *C* shaft. 80 gpm. *Bul. CE-55.*

THRIFTY-THROATED VALVES

Liquids never touch metal in Ace diaphragm valves! Rubber or plastic-lined cast iron, or solid plastic bodies. Sizes ½ to 6". Ask for facts.

ACE-ITE all-purpose toughie

High-impact, rubber-plastic, most economical for average chemicals. ½ to 6". Screw or solvent welded fittings. Valves ½ to 2". NSF-approved. *Bul. 80A.*

Fire the bucket brigade!

No time for passing the bucket when corrosion threatens. With one quick decision you put an end to 85 to 100% of these problems. Just specify *Ace* chemical-resistant plastic piping and rubber-protected equipment. The long-term cost is a drop in the bucket. American Hard Rubber Company's 108 years of experience is at your service.

RIVICLOR ageless strength

All-purpose rigid PVC. Sched. 40, 80 & 120, ½ to 4". Threaded or socket-weld fittings. Valves ½ to 2". NSF-approved. *Free Bul. CE-56.*

ACE *chemical resistant equipment*

BY **AMERICAN** HARD RUBBER COMPANY

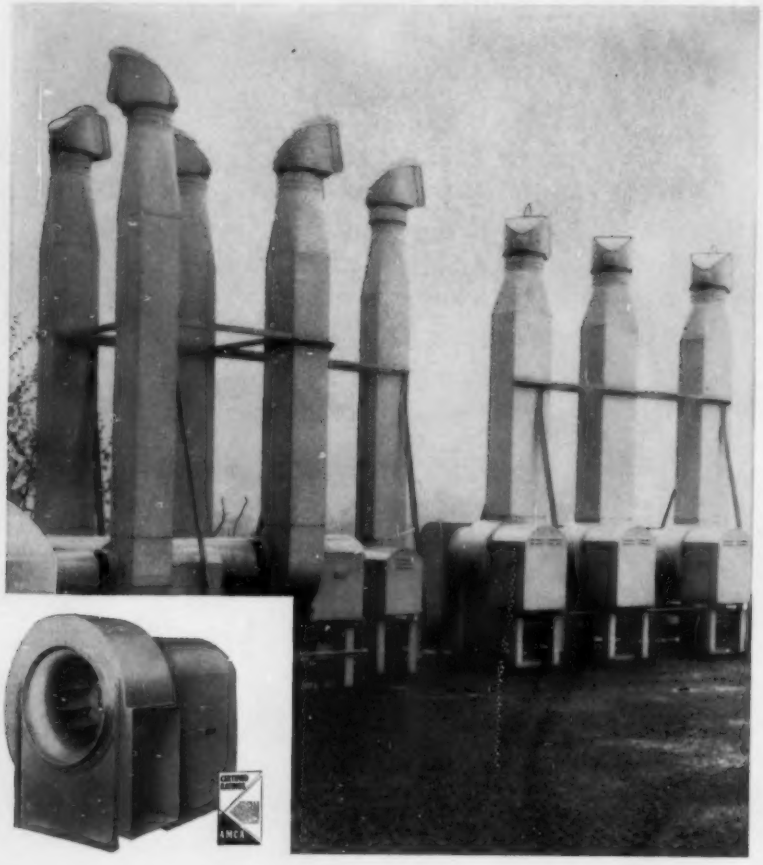
DIVISION OF **AMERACE** CORPORATION

ACE ROAD • BUTLER, N.J.

See ACE equipment in Chemical Engineering Catalog

For more facts circle 624 on Reply Card

ANOTHER PEERLESS ELECTRIC SPECIAL BLOWER APPLICATION



Peerless Electric Blowers Remove Fumes At Gulf Research Center

Shown here are Peerless Electric Backward Curve Blowers applied to exhausting flammable and harmful vapors from the cleaning room of Gulf's Automotive Products Evaluation Laboratory. These heavy duty blowers have arc-welded wheels with cast iron hubs and non-slip taper lock bushings.

Peerless Electric can engineer a blower for *every* important air moving job. Units, similar to this, are available for continuous supply and exhaust duty in air conditioning systems of schools, hospitals, public buildings and industrial installations.

On your next job, let Peerless Electric engineer your air moving needs. Write to: *Peerless Electric Division, H. K. Porter Company, Inc., W. Market Street, Warren, Ohio.*

PEERLESS ELECTRIC DIVISION

PORTER

H. K. PORTER COMPANY, INC.

PORTER SERVES INDUSTRY with steel, rubber and friction products, asbestos textiles, high voltage electrical equipment, electrical wire and cable, wiring systems, motors, fans, blowers, specialty alloys, paints, refractories, tools, forgings and pipe fittings, roll formings and stampings, wire rope and strand.

For more facts circle 625 on Reply Card

NEW PRODUCTS

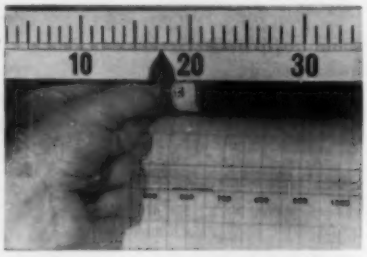
(Begins on page 186)

Regulator bulb is equipped with a close fitting, tin-plated steel bulb well or socket to facilitate installation. Bulb can also be supplied without socket. The valve has Buna N disc for bubble-tight closure, a stainless steel valve stem and O-ring stem seal. Sizes are ½ and ¾ in., temperature range 110-190 F. Fulton Sylphon Div., Robertshaw-Fulton Controls Co.

One of these products may be "just what you're looking for." Use the handy Reader Service Cards to ask for more information on it.

58—MULTIPOINT RECORDER for easy record changing

Model 15 ElectroniK Recorder is announced as a multipoint strip chart recorder which can be converted to change number of points being measured, actuation or range. It is designed for application in laboratories and in industrial processes where frequent record changing is required or where



it may be desirable to change type of primary element or range of measurement. Applications include spot-checking of boiler tube, gearing and transformer oil temperatures in refineries, central stations, nuclear reactor coolants and others. Measurements can be switched from 2 to 3, or up to 24 points by changing a shorting plug and appropriate indicating and print wheels. Substitution of new range card, terminal panel and scale changes actuation and range. Kits are available for point and for actuation and range change. Brown Instruments Div., Minneapolis-Honeywell Regulator Co.

59—GASKET MATERIAL of reinforced nitrile rubber

Vistex III, made of synthetic fiber-reinforced Teflon, is announced as having excellent stability to corrosive gases and liquids under both high

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CENTRIFUGAL PUMP APPLICATION MANUAL

by **BUFFALO PUMPS ENGINEERS**

Here in concise useable form are complete facts on centrifugal pumps and their application. Quick, ready reference is provided by subject sections tabulated at the front. A wealth of illustrations and diagrams amplifies the subject matter.

The purpose of this Engineers' Handbook is to cover the various uses of Centrifugal Pumps, the different types designed to meet specific needs, their operation and the solution of pump problems. Also included are general data and Standards of the Hydraulic Institute.

The pocket-size Manual contains 277 pages of fact-filled information of vital importance to every user of pumps. It will prove an invaluable tool and reference to every Pump Engineer.

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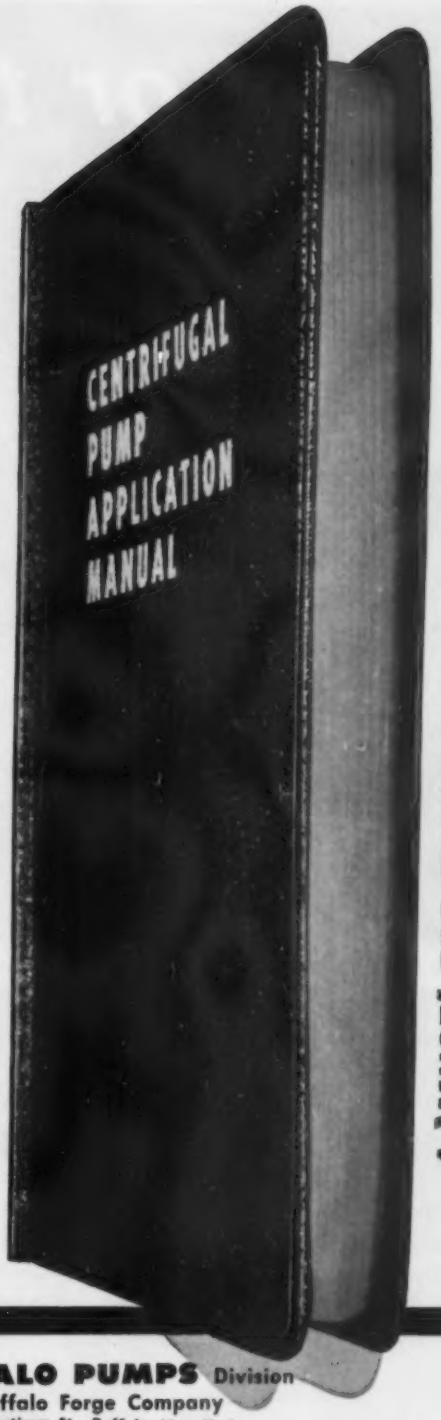
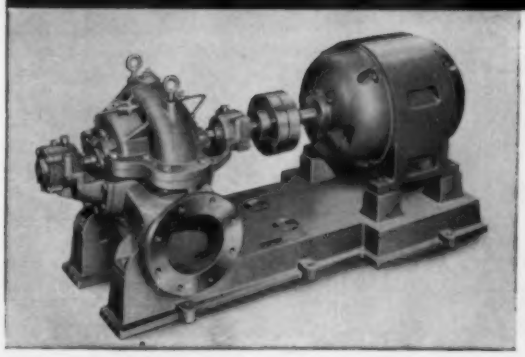


A "MUST" FOR EVERY PUMP ENGINEER

There's a BUFFALO Centrifugal Pump for Your Job!

- Single- and multi-stage pumps for general and special industrial service.
- Wide range of pump designs, sizes, materials and capacities.
- Special pumps for moving paper stocks, corrosive and high temperature liquids and slurries.

You can rely on your nearby Buffalo Representative for expert help. Remember, he helped write the "book".



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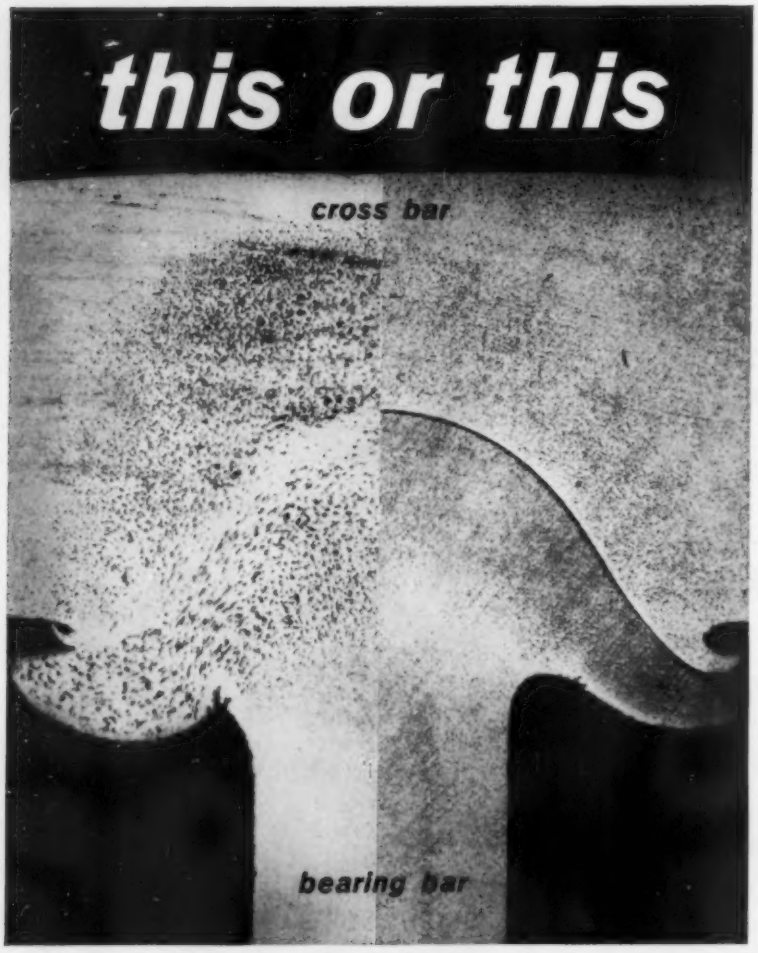


This is Dravo Tru-Weld Grating. In this cross section of a cross bar-bearing bar weld, the metal has fused together. There are no gaps to admit moisture or weaken the joint. It cannot come apart.

Here fusion of metals is incomplete. There is a noticeable gap between bearing bar and cross bar, an open invitation to internal corrosion which can weaken the joint and add to maintenance costs.

which weld for your grating?

Tru-Weld grating is stronger because it is *made* that way. Its added strength comes from a manufacturing process that completely fuses the metal at cross bar-bearing bar joints and holds the bars to exact spacing. The result is grating that stands up under excessive vibration, heavy traffic or in areas where corrosive fumes and moisture are a problem. And Dravo Tru-Weld grating *costs no more.*

Complete estimating, layout and fabricating services are available. Immediate delivery from stocks maintained at nearby Joseph T. Ryerson Service Centers will help you meet exacting construction schedules.

For more information on this new, stronger grating, call the Dravo representative in your area, or write DRAVO CORPORATION, PITTSBURGH 25, PA.

DRAVO

CORPORATION

For more facts circle 627 on Reply Card

NEW PRODUCTS

(Begins on page 186)

and low temperature conditions. Among features claimed are complete compression recovery; exceptional tensile strength; resistance to oil and aromatic fuels; stability to acids, alkalies, aliphatic and aromatic compounds; flexibility; and non-adhesive and non-corrosive properties. Vistex III is available in sheet form up to 30 by 60 in., in standard thicknesses from ⅛ to 1/64 in. Manufacturer says it has 84 lb-per-cubic-foot density, minimum tensile strength of 1000 psi—at 300 F it retains 620 psi tensile strength. It is claimed particularly suited for gaskets where light weight is a factor. A square yard of 1/32-in. Vistex III weighs only 30 oz. The material can be be cut or punched into gaskets, strips or washers. American Felt Co.

60—AIRLESS SPRAY GUN permits recirculation

No. 8395-22HPSSTC Gun Jet is built with a high-volume inlet and outlet, so that liquids can keep recirculating through the system both while the gun is in use and during shut-off periods. It has application with paints and coatings which must be kept at elevated temperatures since it permits continuous recirculation of liquid to maintain desired viscosity; also with

liquids containing certain types of suspended solids in which recirculation maintains desired distribution of solids.

The gun has abrasion resistant tungsten carbide valve seat and needle, stainless steel body and cap, and Teflon packings. Valve seat is directly behind orifice tip, and the valve needle, in passing through the valve seat, automatically cleans the valve. Inlet body is independent of valve trigger mechanism. Liquids are in contact only with the body, valve needle, valve seat and orifice tip. Thus, the spray head outlet of the gun can be cleaned, and the trigger mechanism is not contaminated by liquids. The overall unit

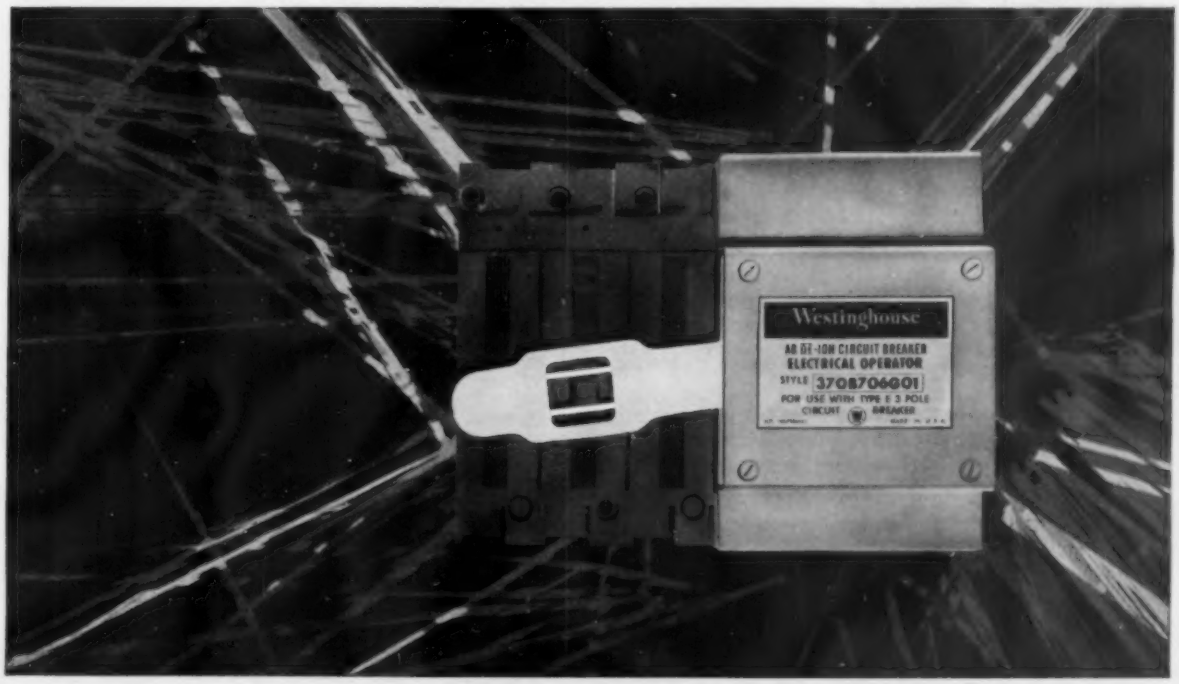
NOW . . .
REMOTE CONTROL
FOR WESTINGHOUSE
TYPES E, EH AND F BREAKERS

This magnetically operated unit turns your types E, EH and F breakers into a remotely controlled switch for—service entry panels—control panels—billboard, railroad yard, parking lot and industrial lighting systems. Use it as a remote switch for battery chargers—engine generators—you can think of a score of other uses.

□ This new Westinghouse Electric Operator is the same size and fits the same space as the breaker it controls. Its action is strong and positive, with the advantage of manual control when desired. In fact, this new electric operator does the same job for the smaller breakers that a motor operator does on the larger type breakers. What's more, the cost is much less. Electric operator works on 120, 240, 480 or 600 volts a-c; 125 or 250 volts d-c.

□ There's a 4-page, 2-color illustrated brochure available describing more about the Westinghouse Electric Operator. For your copy write: Westinghouse Electric Corporation, Standard Control Division, Beaver, Pa. J-30815

YOU CAN BE SURE...IF IT'S Westinghouse



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No File Complete Without These Useful Publications

If you are concerned with the maintenance of important electrical equipment, your files should include practical, dependable information on these subjects:

Insulation Resistance Testing — **Manual 21-JPL**

Earth Resistance Testing — **Bulletin 25 PL**

Motor & Phase Rotation Testing — **Bulletin 80 PL**

Cable Fault Locating — **Bulletin 65 PL**

Speed Measuring — **Bulletin 35 PL**

Simply list on your company letterhead any or all of these bulletins you would like mailed to you. We will see that you receive regularly Biddle Instrument News.

B-913

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Electrical Testing Instruments • Speed Measuring Instruments
Laboratory & Scientific Equipment
1316 ARCH STREET, PHILADELPHIA 7, PA.

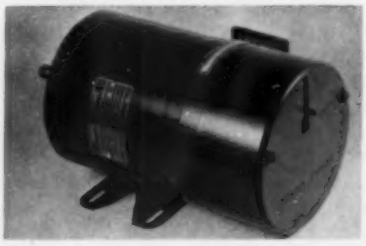
NEW PRODUCTS

(Begins on page 186)

is described as light in weight and easy to handle. Details are in Data Sheet 8395. Spraying Systems Co.

61—A-C BRAKE MOTORS, dripproof or enclosed

This line of fhp, three-phase a-c brake motors, Form G, includes dripproof and totally enclosed, fan-cooled types, both of unified design in which motor and brake are an integral, one-piece unit. Endshield of motor also serves as endshield of brake, providing compact size and neat appearance. These brake motors are intended for use in



overhead doors, cut-off mechanisms, machine tools, conveyors, small elevators and other devices where positive stopping or holding of load is required.

The magnetic brake is used to bring the motor to rest and to hold load stationary when motor is not energized. It is spring set, solenoid, released, and designed to set automatically in event of power failure. Brake torque is 3 lb-ft continuous. When brake is de-energized, springs apply the brake. Brake coil windings are single phase. Quick connection of motors is provided by a large conduit box on the right side facing the opposite shaft end. Company states that 10-year lubrication without maintenance for normal service is provided. The sizes of the motors range from ¼ through ¾ hp, all rated 208-220/440, 550 v, 1725/1425 rpm. The ½ hp model also comes in 1140/950 rpm. General Electric Co.

62—TREATMENT FEEDER for cooling water systems

Hydrotrol is announced as a new type of water treatment feeder and controller for use with recirculating cooling water systems to prevent corrosion, mineral scale, slime and algae. It is claimed to eliminate "drift" of treatment and simplify treatment control. With Hydrotrol, "bleed off" and chemical feed are adjusted automatically, company notes, so that rate of chemical teratment feed and bleed off are

For more facts circle 629 on Reply Card

try this on your pipe...

(it's Pittsburgh Fiber Glass Pipe Insulation)

Acme Insulation Company, Pittsburgh, did . . . on the piping job at Pittsburgh's new Gateway Parking Garage in Gateway Center. And here's what Acme owner Walter S. Peebles says about this installation:

"We chose Pittsburgh Fiber Glass Insulation for its efficiency, appearance and permanence. It's lightweight, handles easily, cuts readily with a knife, is quickly applied. There's a minimum of waste material.

"We've found that Pittsburgh Pipe Insulation holds its size and shape, does not effect the metal it covers, and has a fine record for low-cost maintenance. We used 8,300 ft of it on ½" to 14" pipe for underground heating, snow melting, chilled water lines, general plumbing, sill cocks and drain lines.

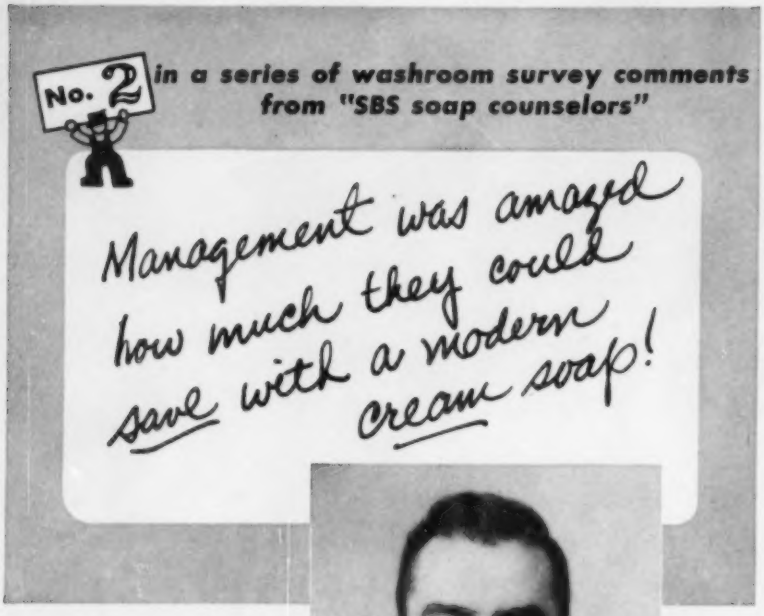
"It's probably the finest insulation that can be used, especially in subsurface locations."

FOR TOP THERMAL CONTROL, THIS IS IT! Pittsburgh Fiber Glass Pipe Insulation is a molded flexible hollow cylinder, slit along its length to provide quick application to pipes or tubing. It has high thermal efficiency for any type pipe insulating job and is surprisingly economical. You can get complete details from your nearest PPG Fiber Glass Sales Office, or by writing to *Pittsburgh Plate Glass Company, Fiber Glass Division, One Gateway Center, Pittsburgh 22, Penna.*

SALES OFFICES: Atlanta, Attleboro, Buffalo, Charlotte, Chicago, Cincinnati, Cleveland, Dallas, Denver, Detroit, Fort Wayne, Houston, Kansas City, Los Angeles, Louisville, Milwaukee, Minneapolis, New Orleans, New York, Philadelphia, Pittsburgh, St. Louis, San Francisco and Washington.

FIBER PPG GLASS PITTSBURGH PLATE GLASS COMPANY

For more facts circle 630 on Reply Card


No. 2
in a series of washroom survey comments from "SBS soap counselors"
Management was amazed how much they could save with a modern cream soap!

John F. Murphy

is a veteran SBS soap counselor in a major industrial market, has helped many managements pinpoint the most economical solution to skin cleansing problems. This is a typical example.

"Our washroom surveys found maintenance dollars (and employee morale) literally disappearing down the drains at a midwest stamping plant employing 2300 workers. Many employees complained that the powdered soap in general use irritated their skin. Few dispensers were operating efficiently. The result was a lavish waste of soap, slippery floors, unsightly washrooms . . . maintenance couldn't keep up! OPERATION PINPOINT demonstrated not only how this plant could cut its soap costs but how it could drastically reduce maintenance costs by using SBS-60, a *cream* deodorant soap specially formulated for industrial use. This modern cleansing agent removes *all* the general soils in the stamping plant . . . is equally safe on hands, face or body . . . and virtually eliminates soap waste!"

Money-saving suggestions like this *begin* with OPERATION PINPOINT — a thought-provoking presentation filled with facts about skin hygiene and washroom maintenance. The SBS soap counselor serving your area can pinpoint the right soap to do every skin cleansing job best and at lowest cost in your plant. Let him show you OPERATION PINPOINT . . . just call your nearest SBS office, collect.

the washword of industry

SBS sugar beet products co.

SAGINAW, MICH. • Los Angeles, Calif. • Newark, N.J.
CANADA: Chemical By-Products, Ltd., Toronto, Ontario

For more facts circle 631 on Reply Card

NEW PRODUCTS

(Begins on page 186)

always in direct proportion to rate of water evaporation or the cooling load on the system.

Foremost among advantages cited are savings up to 95 per cent in water analyses, control labor and attention required. Hydrotrol is also said to enable worthwhile savings in chemical and water. It may be used with either acid or alkaline treatments. A Hydrotrol controller without feeder can be added to existing pump installations. Heller Laboratories, Inc.

63—FLOW CONTROL VALVE features integral check

CircuitStak—Model YP-175—a pipeless ¾-in. dual flow-control valve with integral check is announced as a non-pressure-compensated valve that

provides for separate, adjustable metering-out of fluid in both cylinder lines. It installs between a ½-, ¾- or 1-in. selenoid-controlled, pilot-operated valve and the sub-plate. The stacking of circuit components eliminates interconnecting pipes, manufacturer points out, and permits additions to the circuit without panel alteration or piping. Double A Products Co.

64—CARBIDES can be machined in your plant

Only conventional tools are needed to machine Ferro-Tic S, it is announced; with this material you can produce carbide parts and tools to withstand high temperature or corrosive media right in the shop. The steel-bonded carbides come in two grades, S-45 and S-55, both produced by powder metallurgy techniques embedding tiny crystals of titanium carbide in a relatively soft matrix of stainless steel. The resultant composite is said to retain properties of both constituents: machinability and resistance to heat and corrosion of the stainless steel, and the ultra-hard-

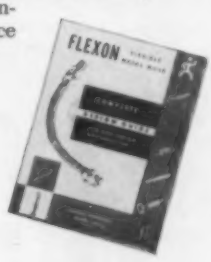
METAL HOSE to absorb any motion... meet all pressure, temperature, and fluid needs

Flexonics capabilities and experience in meeting the full range of piping problems—from the simplest to the most drastic—is without equal. Whether your requirements involve one or any combination of motion, pressure, corrosion, temperature, or fluid factors, Flexonics will quickly meet the challenge.

Note in the photo above how flexible hose absorbs shock loads while it solves a misalignment problem in the lines of a press at Kropp Forge Company.

The complete Flexonics standard line of metal hose will provide you the construction, material, and size (3/16" to 24" I.D.) that the job demands. Your special engineering requirements are more readily met by Flexonics vast facilities—enjoying a record of outstanding service to every segment of industry.

METAL HOSE DESIGN GUIDE
Write for your free copy . . . a must for your reference file.



IH-355

Flexonics
corporation

In Canada: Flexonics Corporation of Canada, Brampton, Ont.

EXPANSION JOINTS | METAL HOSE | SYNTHETIC HOSE | BELLOWS | AERO/SPACE COMPONENTS

A SUBSIDIARY OF CALUMET & HECLA, INC.

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FLEXONICS CORPORATION
1340 South Third Ave.
Maywood, Illinois

Please send my personal copy of Flexonics Metal Hose Design Guide covering in detail Flexonics products and services for metal hose applications.

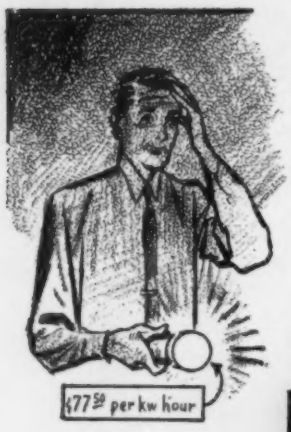
For more facts circle 632 on Reply Card

Facts of Light!

CHAMPION Lamps

SOMETIMES IT COSTS MORE TO OPERATE ONE FLUORESCENT THAN TO OPERATE TWO

When only one fluorescent lamp is operating on a lead-lag ballast designed to handle two lamps, more line current can be drawn than if both lamps were operating. This is due to a shift in power factor. Moral: keep all lamps operating — you can draw less current and get twice the light.



IT COSTS $77.50 per KW hour to RUN A FLASHLIGHT

When a lamp is run on a flashlight battery the power cost is in the vicinity of $77.50 per KW hour. The power cost to operate lamps from residential electric supply is only 2.66 cents per KW hour.

A LITTLE VARIATION IN VOLTAGE CAN MEAN A LOT IN THE LIFE OF A LAMP

Incandescent lamps are designed to yield maximum lighting economy when used on circuits where the voltage is the same as that printed on the bulb. When the circuit voltage is 5 volts above the bulb rating lamp life can be cut in half. A variation of 5 volts below rating can double lamp life.

YOUR NEW CHAMPION LAMP HAS ALREADY BEEN LIGHTED AT LEAST 7 TIMES

Every Champion lamp is lighted a minimum of 7 times before it is packaged. Checks like this are typical of the strict quality control maintained at Champion and one of the reasons why the Champion Diamond on the outside of a lamp means a dependable source of light on the inside.

CHAMPION LAMP WORKS, Lynn, Massachusetts

CHAMPION INCANDESCENT-FLUORESCENT • *YOUR BEST BUY IN LAMPS*

For more facts circle 633 on Reply Card

NEW PRODUCTS

(Begins on page 186)

ness of the titanium carbide.

Difference in the two grades lies in relative machinability. Ferro-Tic S-45, with a hardness of Rockwell C 45, may be machined with any single-point of multiple-point cutting tool. The harder Ferro-Tic S-55 (Rockwell C 55) is suitable only for such basic operations as sawing, turning and drilling, company points out, with milling or tapping not recommended. Both grades may be ground and may be joined to other metals by welding or brazing. Suggested applications include valves or valve seats for use in chemical and food processing; knives and choppers requiring utmost cleanliness and corrosion resistance; seals for pumps; homogenizing valves; high temperature bearings; many other items in which cast cobalt-base alloys or tungsten carbides might normally be employed. Blanks are available in rectangular form up to 1 by 2 by 7 in. Round bars, other sizes and shapes can be ordered. Sintercast Div., Chromalloy Corp.

More information on any of these products can be yours without cost or obligation. Just circle the item numbers on the Reader Service Cards provided on pages 275-276.

65—PIPE COVERING is flexible, ozone resistant

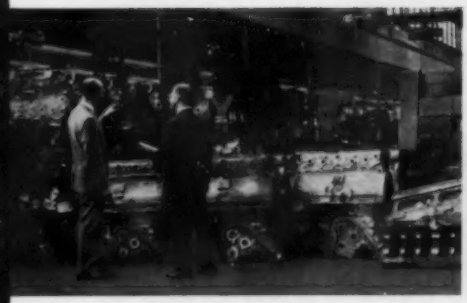
Major improvements announced for this company's foamed plastic pipe covering insulation are said to give it a higher temperature range, ozone resistance and smoother surface. The improved product, Armaflex 22, is for use on liquid cooling and heating lines, chilled water lines and other cold lines in plumbing, heating, air conditioning, refrigeration and processing applications. Manufacturer says it can be used from below zero to 220 F and can be applied to sharp bends and elbows without fissuring or cracking at the area under strain.

This insulation, with its average density reduced to 7 lb per cubic foot, has a smooth, uniform outer surface finish, resulting in a neat looking installation, unfinished or coated. Its closed cellular structure gives it a low value of 0.28 at 75 F mean temperature, it is stated, and it resists moisture and deterioration with the result that thermal efficiency remains high in service. Its flexibility facili-

Thomas A. Simms,
Plant Engineer,
Mack Trucks, Inc.

Surveying...
training...
inspecting...

Puritan Engineered Maintenance gives Mack Trucks "most comprehensive housekeeping program we've seen".



Puritan representative surveys Mack Trucks' plant and maintenance procedures.

Puritan training program speeds and eases work of custodians and supervisors.

Scheduled inspections help maintain housekeeping standards at peak level.

"I've never seen anything quite as comprehensive as the service Puritan gives its sanitary maintenance supply customers," says T. A. Simms, Plant Engineer, Mack Trucks, Inc., Plainfield, N. J. "Its Engineered Maintenance Program made a two-fisted attack on our housekeeping problems.

"Starting with a thorough survey of our plant and maintenance procedures, Puritan engineers prepared an individually-planned program adapted to our exact needs.

"They then set up cleaning procedures based on orderly schedules. With the training Puritan gives, the work of our custodians and supervisors is easier, more efficient.

"Finally, Puritan's continuing inspection service helps keep our maintenance standards at high levels."

PURITAN CHEMICAL COMPANY
EXECUTIVE OFFICES: 916 ASHBY STREET, N.W. ATLANTA 18, GEORGIA
PLANTS AND WAREHOUSES: ATLANTA, GA. • HOUSTON, TEX. • ST. LOUIS, MO.

For more facts circle 634 on Reply Card

You, too, may benefit from a Puritan Engineered Maintenance Program. As a user of nationally-known Puritan Sanitary Maintenance Products, you get this service absolutely free.

Find out how it works. Send today for free booklet, ENGINEERED MAINTENANCE.

PURITAN CHEMICAL COMPANY
916 Ashby Street, N.W. • Atlanta 18, Georgia

Send me a free copy of your 16-page booklet, ENGINEERED MAINTENANCE.

NAME _____ TITLE _____

COMPANY _____

ADDRESS _____ CITY _____ STATE _____

New DAY "RJ" Dust Filter

CONTROLS DUST SAVES DOLLARS

only 3 moving parts

Built under patents of The DAY Company and H. J. Hersey, Jr.

Because of its new, simplified design the DAY "RJ" dust filter will save you many dollars on initial investment, installation, operation and maintenance. Some of the important new construction features of this dust filter are: a new, quick-opening reverse-air, counter-flow valve for maintaining filter media porosity; a new, reverse-air pressure blower arrangement, and new, air tight, yet quickly opened inspection doors.

This patented DAY dust filter has only 3 moving parts but controls dust effectively, efficiently (99.99+%) and economically. It represents the latest refinement in a long-tested, plant-proven dust filter. Using felted filter sleeves to capture dust, the "RJ" is now available in 5 sizes for handling from 300 to 6400 CFM of air (for larger capacities, multiple groupings are furnished).

For more detailed information write toDAY for free Bulletin G-30. It's filled with facts, specifications and dimensions.

The DAY Company

SOLD in UNITED STATES by
The DAY SALES Company
807 Third Avenue N.E.
Minneapolis 13, Minnesota
FEderal 6-9671

MADE and SOLD in CANADA by
The DAY Company of Canada Limited
Rexdale (Toronto), Ontario, Canada
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Rexdale, Cherry 1-8589

Representatives in Principal Cities

EXPERIENCE ENGINEERED . . . LABORATORY TESTED . . . PLANT PROVEN
Dust Control • Pneumatic Conveying • Bulk Storage
EQUIPMENT . . . SYSTEMS . . . INSTALLATION

For more facts circle 635 on Reply Card

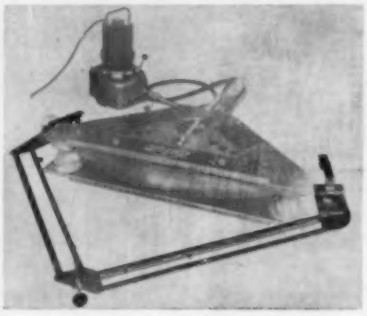
NEW PRODUCTS

(Begins on page 186)

tates application, even in close quarters. Armaflex 22 comes in three wall thicknesses, each calculated to prevent condensation on cold lines within their recommended usage ranges. For below-zero temperatures, Armaflex 22 is applied in multiple thicknesses. Armstrong Cork Co.

66—SCALE indicates degree of bend on pipe

No. 1807 Pipe Bending Degree Indicator is designed to give the degree of bend on ½-to 6-in. diam. pipe. It



fits hydraulic pipe and conduit benders operating in a horizontal position, and the pipe need not be removed to determine the degree of bend, manufacturer states. Greenlee Tool Co.

67—COLORED COATING protects asphalt surfaces

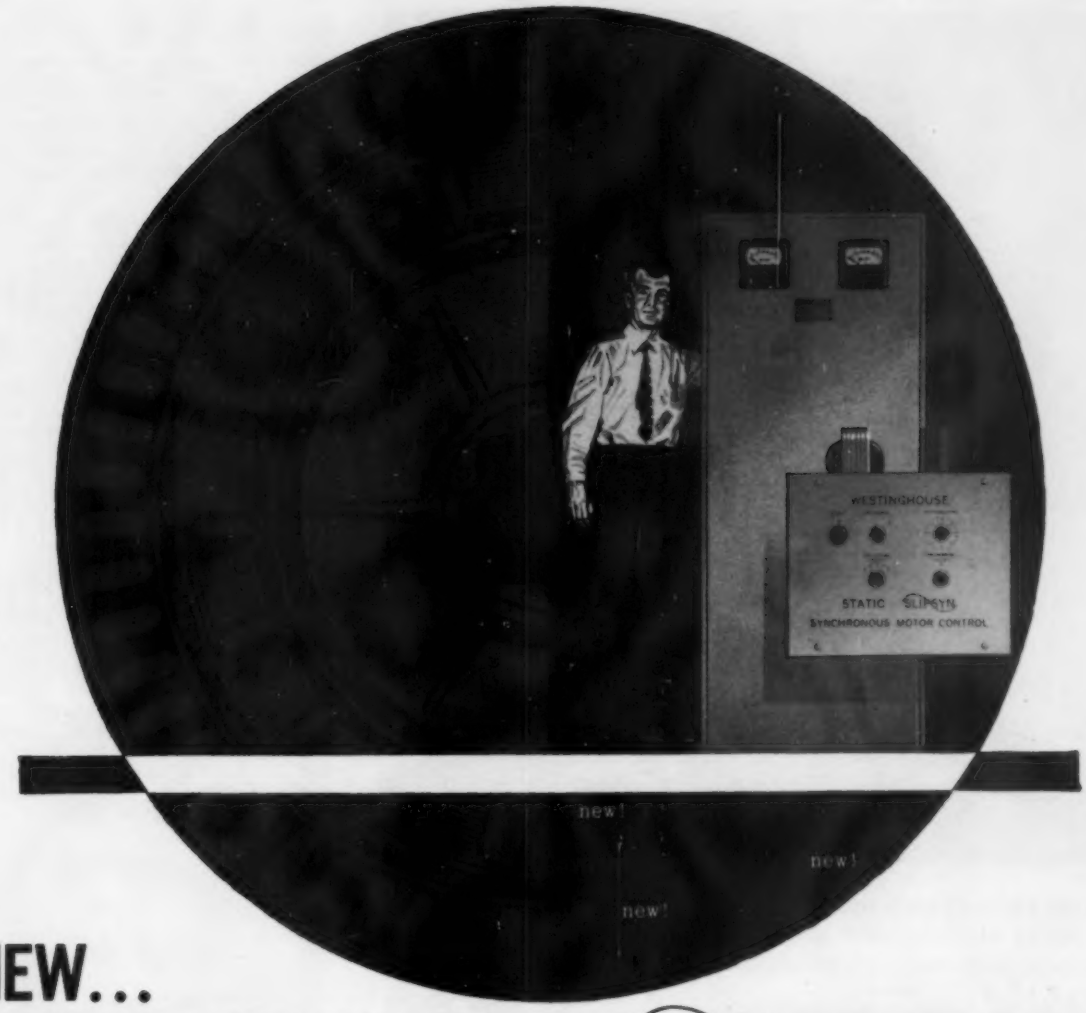
Vynatex 23 comes in green, gray and brick red. Besides protecting asphalt pavements, it serves to improve their appearance. Manufacturer says the colors are non-fading and the material guards the asphalt surfaces against drying action of sun, oxidation and freezing. Applications include entrances, walks, parking lanes, restricted zones, recreational areas, driveways, platforms, "red carpet" areas. Bulletin L-1828A gives further details. Maintenance, Inc.

68—ANGLE VALVE serves double-purpose role

No. 74 Angle Valve doubles for liquid level gaging and instrument piping, combining in one unit features designed to prevent freezing and eliminate wear due to galling. With addition of a pipe plug with integral bleed fitting, basic liquid level gage becomes Instrument Valve 74G, eliminating multiple connections in instrument and general use.

Manufacturer notes that this valve combines advantages of a single-piece

For more facts circle 634 on Reply Card



NEW... WESTINGHOUSE STATIC SLIPSYN CONTROL

UPS RELIABILITY, VIRTUALLY ELIMINATES MAINTENANCE

STOP PUZZLING over synchronous motor controls . . . here's the advanced way to gain top performance. The all-new Westinghouse Static Slipsyn® control pays its own way by chopping motor control maintenance costs, practically eliminating down time and increasing reliability. Check these advantages:

WESTINGHOUSE STATIC SYNCHRONIZING CONTROL has no moving parts. It uses simple, reliable, transistorized networks instead of conventional relays . . . no contacts, bearings and springs to corrode, wear and fail. Size and weight are greatly reduced—and Static Slipsyn control is immune to contaminated, dusty surroundings.

WESTINGHOUSE STATIC SYNCHRONIZING CONTROL precisely applies motor field excitation at proper speed and pole position up to and including 99% of synchronous speed. Pull-out protection is positive and adjustable to avoid false tripping.

FOR NEW AND OLD INSTALLATIONS. Your Westinghouse salesman will help you apply the completely packaged Static Slipsyn control to synchronous motor installations now being planned. And he can show you how static synchronizing control units can replace the conventional, mechanical relays in your present control enclosures. Either way, Westinghouse Static Slipsyn control saves big money through reduced maintenance, improved reliability, shorter down times.

Contact your local representative or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa. J-25001

YOU CAN BE SURE...IF IT'S

Westinghouse

WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV ALTERNATE FRIDAYS

For more facts circle 636 on Reply Card

Fed up with old-style mixing? You'll be amazed at the results when you toss out cumbersome, hard-to-maintain mixing equipment and replace it with a simple, efficient LIGHTNIN Mixer.

You can mix anything that flows, in any amount up to and including six million gallons at one time. There's no guesswork about it. MIXCO engineers have devised an exact method that tells how much horsepower and torque you need to get the results you want.

Then the right mixer is specified from an almost unlimited range of power-speed combinations, assembled from standard stock components.

Every LIGHTNIN Mixer is guaranteed **unconditionally** to do the job you expect it to do. Hundreds of them have been in continuous service 20 years and more.

If this sounds like a common-sense way to approach a fluid-mixing problem, call in your LIGHTNIN Mixer representative now. His name is in Thomas' Register. Or write us direct.

Turbine-type LIGHTNIN Mixer, one of a series available in standard sizes from 1 to 500 hp.

Send catalog information on:

- ☐ Portable mixers
- ☐ Top-entering mixers
- ☐ Side-entering mixers
- ☐ All types

Lightnin' Mixers

MIXCO fluid mixing specialists

Check, clip, and mail with your name, title, company address to:

MIXING EQUIPMENT Co., Inc., 144-d Mt. Read Blvd., Rochester 3, N. Y.
In Canada: Greey Mixing Equipment, Ltd., 100 Miranda Ave., Toronto 19, Ont.

For more facts circle 637 on Reply Card

NEW PRODUCTS

(Begins on page 186)

forged valve body and bonnet flange to which is mounted a simplified outside screw and yoke bolted bonnet and reciprocating backseating stem. Bolted bonnet uses a forged yoke which supports stem away from valve body and a separate forged gland-follower which bears directly on packing and is independent of yoke. This construction places threaded portion of stem outside valve body, where it is not affected by temperature of liquid being handled. Valve has an ASA rating of 1440 lb, 100 F and a commercial rating 4000 lb. It weighs 8 lb, is available in various connections and materials, including Teflon. Jerguson Gage & Valve Co.

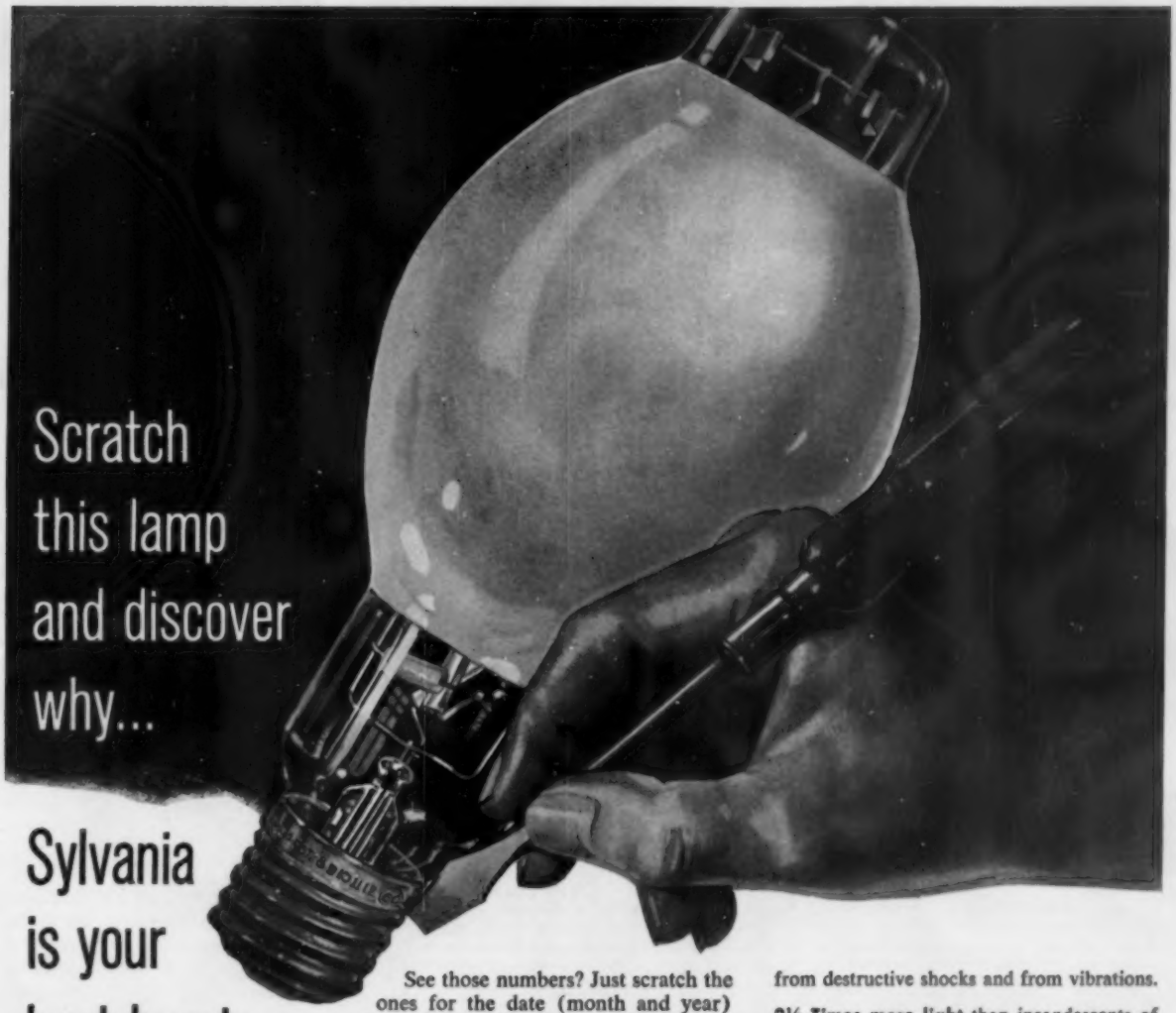
69—ROOF VENTILATORS for duct, exhaust applications

Four centrifugal power roof ventilators for high-capacity duct and flue exhaust applications are new additions to company's L-CRF units, increasing capacity in this line from 11,000 to

29,790 cfm. The ventilators have a weather-tight housing of spun aluminum with a steel base; the fan motor is direct-connected to airfoil-type fan. The low silhouette common in all L-CRF models has been maintained. The fan motor has pressure type self-cooling construction designed to protect it from heat built-up and exhaust air impurities. Complete specifications are in Bulletin 2701-S. Ilg Electric Ventilating Co.

70—FISH TAPE for use with aluminum conduit

Flexi-Strand is announced as an extra flexible round fish tape for jobs using aluminum conduit. It is made of preformed galvanized aircraft cable, has no sharp edges to gouge or cut into soft conduit. It is said to be so flexible that it will take sharp bends in aluminum without cutting, and take



Scratch this lamp and discover why...

Sylvania is your best buy in mercury lamps today!

See those numbers? Just scratch the ones for the date (month and year) when you install a Sylvania Ruggedized Mercury Lamp. You'll not only have a simple moneysaving record of installations, you'll also mark the beginning of the longest, brightest service of any mercury lamp you can buy!

28% Longer life. That's what you get with Sylvania Ruggedized Mercury Lamps. An average usable life of 9,000 hours! *With consistently high lumen maintenance all the way!*

Less maintenance. Ideal for high-bay or highway installations. Pyrex weather-durable glass protects against moisture, condensation, moisture-laden or humid atmosphere, thermal shock. Ruggedized arc tube construction is specifically designed to protect the lamp from destructive shocks and from vibrations.

2½ Times more light than incandescents of the same wattage. Moreover, Sylvania phosphor improvements have increased the output of SH-1/R A.S.A. designation H1GL/W Mercury Lamps to 25,000 lumens—most efficient of any commercial mercury lamp!

Insured Performance. Only Sylvania, with an *exclusive* "Light Insurance Policy," guarantees you lower TCL (Total Cost of Lighting), which means cost of lamp plus power plus maintenance. Call your Sylvania representative or write us: Sylvania Lighting Products, a Division of Sylvania Electric Products Inc., Dept. 99, 60 Boston Street, Salem, Mass. In Canada: Sylvania Electric (Canada) Ltd., P.O. Box 2190, Station "O," Montreal 9.

SYLVANIA

Subsidiary of **GENERAL TELEPHONE & ELECTRONICS**

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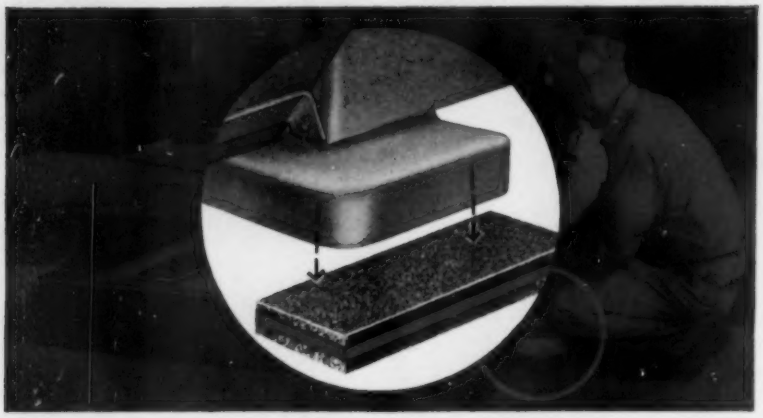


How to Install A Machine For Practically Nothing!

Plant, after plant after plant tell us that Unisorb pads more than pay for themselves by saving time, materials and labor in machine installation.

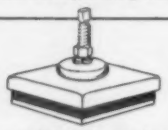
Now, whether a single unit or a whole plant, installation is a matter of minutes instead of hours. Unisorb pads are cut to size, buttered with Unisorb Cement and machine immediately set in place. No bolts or lag screws, no floor drilling, no tricky spotting. Actual savings go to 80%!

Unisorb is also a lifesaver on plant moves. A Unisorb Mounting Program, prepared in advance, speeds the entire move — production lines can be returned to operation overnight or over a week-end.

Here are the three methods that give you this money-saving machine mounting . . .

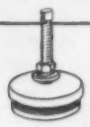
Unisorb Mounting Pads

Specially engineered in a selection of densities and thickness to provide optimum vibration control for all types of machines. Absorbs 85% of transmitted vibration, cuts noise, improves machine performance, reduces maintenance.



Unisorb Level-Rite/ Heavy Duty

The Level-Rite line has been developed for fast, precise leveling and effective vibration control. Machine legs rest on exclusive, free floating screw-post and leveling plate. No bolts, lag screws or cement required, machine is always mobile.



Unisorb Level-Rite "200"

The "Junior" model is a practical, low-cost mount for controlling vibration and maintaining level of small and medium sized machines. Ideal for light machine tools, office, air conditioning and laboratory equipment, layout benches, and shop tools. Loadings up to 200 lbs. per unit.

Remember — to simplify installation, improve performance, and control vibration . . .

UNISORB MOUNTS MAKE THE DIFFERENCE

A complete selection of densities and thicknesses for the smallest laboratory device to giant presses.

Ask for a Money-Back Trial . . . NOW!

UNISORB

UNISORB 265 SOUTH STREET, BOSTON 11, MASSACHUSETTS

Division of The FELTERS Company New York, N. Y. • Chicago, Ill. • Detroit, Mich. • Upper Darby, Penna. • St. Louis, Mo. • Taylor Felt & Supply Co., San Francisco, Calif. • Acorn Mfg. Co., Los Angeles, Calif.

Please send me a Unisorb Sample and Free Book.

Name.....

Company.....

Address.....

City.....Zone....State.....

FED-62

For more facts circle 639 on Reply Card

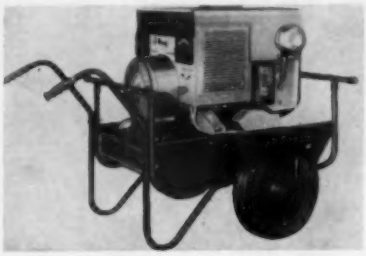
NEW PRODUCTS

(Begins on page 186)

extreme flexing without kinking or taking a set. According to company, it withstands up to 1500 lb pull test. It has an extra large eye ot accommodate the following wires: 20 No. 14; 15 No. 12; 10 No. 10; four No. 8, and three No. 6. The tape comes in reel type, handle type and plain. Ideal Industries, Inc.

71—D-C WELDER doubles as a-c power source

Its 3500 w of 60-cycle, single-phase a-c power makes the improved Bug Welding Machines more versatile power sources for lighting, motor, tools and other electric equipment. The generator design, incorporating start windings in the main generator, provides for inexpensive electric start-



ing. Optional rope start or Redi-pull automatic recoil starters are also standard. The engine's generated d-c welding output is 200 amp, suitable for welding with E 6010. Operator has continuous current control between 10 main tap settings of 45 to 200 amp. The new welders handle a-c and d-c electrodes from 1/16 to 5/32 in. diam, and most 3/16-in. diam electrodes up to the capacity of the unit. Two or more welders can be connected in parallel for extra heavy welding. The engine driven welder has a two-wheel dolly of welded tubular steel construction and rubber hand grips, as shown, which can be removed for stationary operation. A. O. Smith Corp.

72—TRANSMISSION FLUIDS offered in two types

Two new automatic transmission fluids—Type A-Suffix A and Type C—are announced as having flash points above 400 F, some 65 to 85 deg above usual flash points of only 315 to 335 F for such fluids. According to company, this thermal stability results from blending oils used in the manufacture of the fluids; and the higher thermal resistance prevents these fluids from "breaking down"

For more facts circle 640 on Reply Card ——→

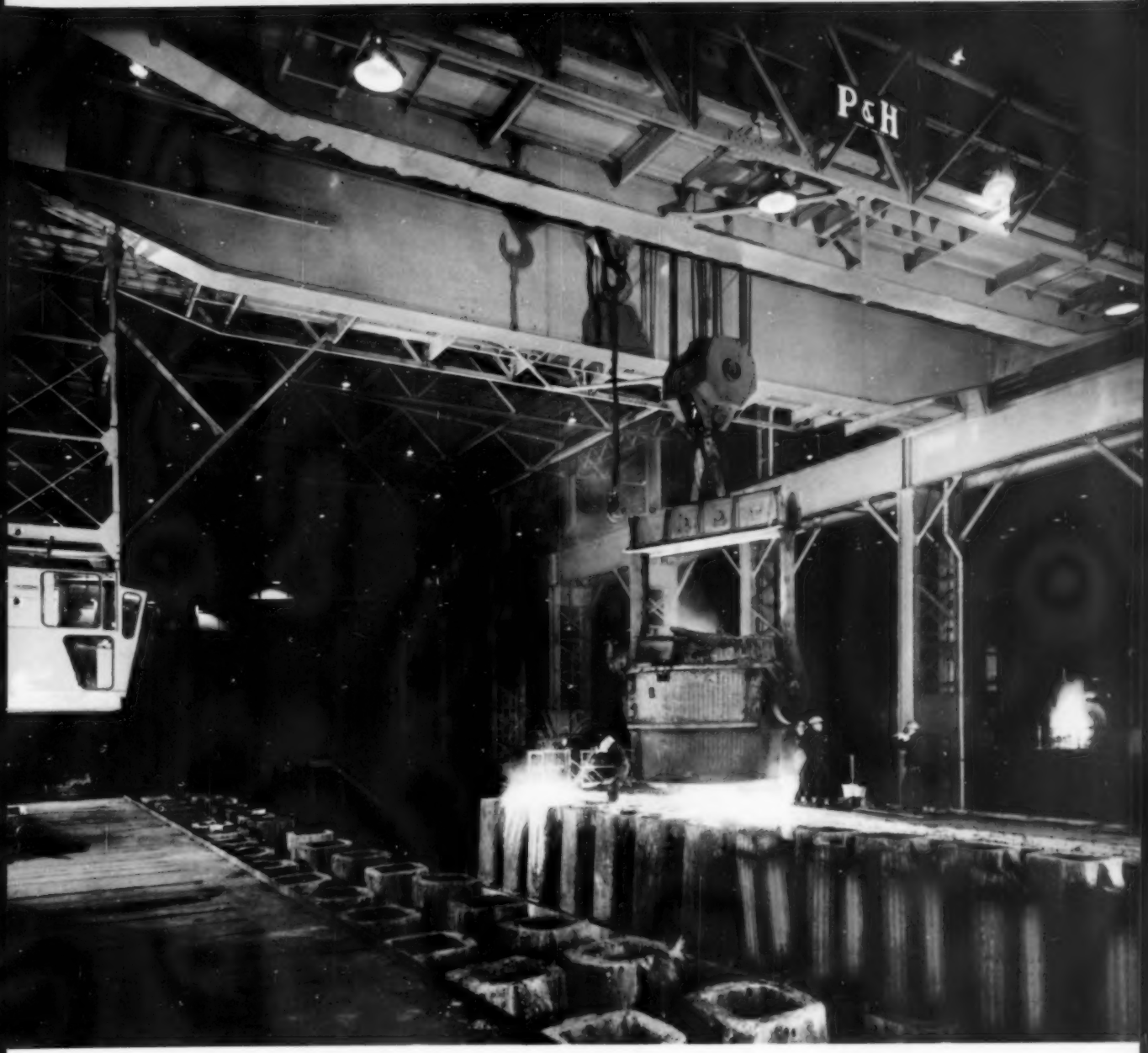


Photo courtesy Acme Steel Company, Riverdale, Illinois.

FOR EVERY APPLICATION, THERE'S ONE CRANE OUTSTANDING...

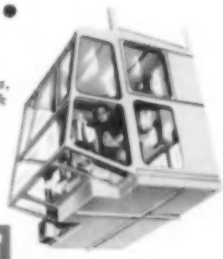
IN STEEL MILLS: This 100-ton P&H crane lifts, transports and "spots" tremendous loads of molten steel as surely and deftly as you handle a coffee cup.

P&H steel mill cranes perform tasks like this effortlessly and dependably because they are specifically designed for steel mill service . . . to handle massive loads, withstand searing heat, ignore frequent shock loads.

What's more, P&H carefully engineers every crane to meet specific job requirements . . . to consider all factors affecting performance. Special operating problems are taken in stride. Result: P&H cranes chalk up almost unbelievable service records month after month, year after year, decade after decade.

Isn't this the kind of performance you want, too? Write for bulletin C-42 to Dept. 120, Harnischfeger Corporation, Milwaukee 46, Wis.

P&H enclosed cabs have full-view safety glass windows, for unrestricted view of work area. Cabs can be heated and air conditioned where cold, heat, smoke or fumes render ordinary cabs uncomfortable or unsafe.



P&H
OVERHEAD CRANES

HARNISCHFEGER
Milwaukee 46, Wisconsin

Photo: Courtesy Isaacson Iron Works Co., Seattle, Washington

P&H PRECISION CONTROL SPOTS HEAVY STEEL ACCURATELY, SAFELY

This West Coast steel-fabricating company depends on P&H Balanced Design Hevi-Lift hoists to keep heavy steel beams and fabricated structures moving through its shops.

Note the unique method of installation which provides a high degree of flexibility . . . hoists can be used alone — or hoists can be teamed up to handle extra-long sections.

This company selected P&H Balanced Design Hevi-Lifts because they will stand up longer, under heavier duty cycles — with less maintenance — than any other hoist they could buy. Reason: Balanced Design means that every component has been balanced with every other component for maximum strength and performance characteristics.

If uninterrupted through-the-air material handling is important to you, too, then it will pay you to find out more about these new hoists. Send for bulletin H-55, Dept. 222, Harnischfeger Corporation, Milwaukee 46, Wis.

HARNISCHFEGER
Milwaukee 46, Wisconsin

P&H
HEVI-LIFT HOISTS

NEW PRODUCTS

(Begins on page 186)

under extreme operating conditions. An oxidation inhibitor is another ingredient of the fluids. Both are claimed to have no harmful effects on rubber seals and to possess improved low temp viscosity characteristics. Lubrication Engineers, Inc.

73—DUST FILTER offers design improvements

Basic design change in the improved RJ Dust Filter is a simplified method for maintaining porosity of filtering media. It works like this: A reverse air plenum (pressurized by a centrifugal blower) rotates in the filter's top chamber. As this plenum cycles between filter sleeve openings a butterfly valve is in a closed position and the plenum filled with high pressure air from the centrifugal blower. As plenum centers over filter sleeve, the butterfly valve opens and high velocity, counterflow air is discharged to remove accumulated dust from filter sleeve. Sleeves are counterflowed one at a time, and the most recently cleaned one is rendered inactive by trailing plate, thus minimizing redeposition. Plenum rotates from sleeve to sleeve. By maintaining porosity of filter sleeves, back pressure and air volume remain constant, manufacturer points out.

Other improvements announced include addition of a reverse air pressure blower and a new quick-opening inspection doors. Five sizes provide air capacities from 285 to 6400 cfm; larger capacities are achieved by multiple groupings. Single units have round housings; multiple ones, square or rectangular housings. This filter is claimed to permit high filtering rates (air to cloth ratios up to 20 to 1) while operating at efficiencies over 99 per cent. Bulletin G30 gives details. The Day Sales Co.

Use the Reader Service Cards provided on pages 275-276 to ask for more information on the products. Circle item numbers of all of the products in which you are interested.

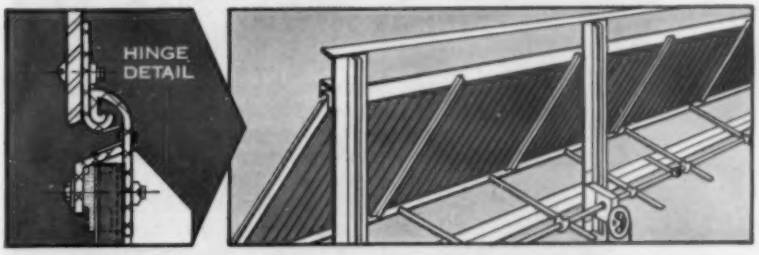
74—ALUMINUM COATING gives high sheen finish

Totalume is said to produce a lustrous, rust inhibitive aluminum finish on fences, tanks, standpipes, easily and economically. The protective

New Replasa-Panal Solves Old Glazing Problems

One of your own men can now quickly replace your broken glass with shatterproof fiberglass reinforced plastic panels that have the best light transmission quality money can buy. Replasa-Panels are specially formed to be easy to store and carry, install quickly, and make a secure, weathertight job, yet they cost no more than ordinary wire glass. No cutting, fitting, or face puttying!

This is your finest assurance against broken glass and leaky skylights and windows, for either top-hinged or fixed sash, when muntin bars are still usable as a frame. For complete information and prices, mail in the coupon below.



OR, IF ENTIRE SECTIONS OF SASH NEED REPLACING, use Aluma-Sash

We have installed hundreds of thousands of feet of this complete sash replacement system, consisting of top quality translucent plastic and a continuous aluminum hinged frame designed for years of rugged service, at the lowest possible contract price. Write for details.

Stylux BY BUTLER

Our superior fiberglass reinforced plastic panels are made from Butler Stylux, the acrylic-fortified panel that has been job-proved for outstanding durability, weather endurance, and light transmission. We carry the entire Stylux line, and can ship direct to you. Mail this coupon today!

H. A. HARRY GLASS COMPANY 1644 Milwaukee Ave., Chicago 47, Ill. Phone: Dickens 2-1660

40 years experience in solving industrial glazing problems.

Please send price information and detail drawings. We are interested in: (check one or both)

☐ Replacement of individual glazing units by plant's own crew (Replasa-Panal)

☐ Replacement of entire sash sections (Aluma-Sash)

Name _____ Title _____

Company _____

Address _____

City _____ Zone _____ State _____

Replasa-Panal & Aluma-Sash—Trade Marks H. A. Harry Glass Co.
Stylux—Reg. U. S. Pat. Off., Butler Manufacturing Co.

For more facts circle 641 on Reply Card

More than paid for itself in... 20 MONTHS!

A steel mill installed this Green Aerodyne Dust Collector to prevent coal dust wear on the blades of their new turbo-blower.

This turbo-blower ran 24 hours a day, 7 days a week, for 20 months.

Then, for the first time, it was shut down for inspection. They removed the top to inspect blade wear. Did the blower need a reblading job—a job that would cost much more than the total installation costs of the Green Aerodyne Dust Collector?

No. They just re-installed the top and ordered the turbo-blower back into continuous operation and ticketed the next inspection 18 months hence.

Oh yes, when will the Aerodyne Dust Collector wear out? Nobody seems to know. Its life-in-use seems to be practically unlimited.

★ *These Green Aerodyne Dust Collectors really do their jobs. Might save you a considerable sum, too. We'd be happy to show you how.*

Green

THE GREEN FUEL ECONOMIZER CO., INC.

BEACON 3, NEW YORK

For more facts circle 642 on Reply Card

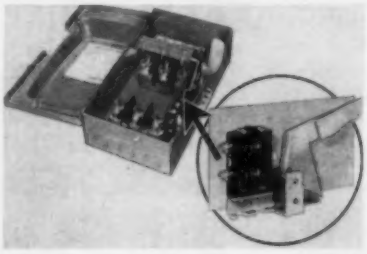
NEW PRODUCTS

(Begins on page 136)

finish is formulated to retain a high lustre even under adverse conditions —to withstand temperatures to 1000 F. Manufacturer says Totalume can be used on damp or rusted surfaces. The Wilbur & Williams Co., Inc.

75—INTERLOCK KIT for heavy-duty safety switches

This electrical interlock kit permits field installation of additional contacts in safety switches. Because the interlock contacts make or break ahead of main switch blades, the interlock



can be used within control circuits. Available for all of company's heavy-duty safety switches, interlocks are supplied with one normally-open and one normally-closed contact. Interlock assembly is actuated by handle of safety switch. Cost savings result from use of three-pole switches from stock rather than special-order four-pole switches. Square D Co.

76—SILENCER for high velocity air, gas flows

Unisilco Absorption Type Silencer is of the absorption type having a perforated air passage tube entirely enclosed by the sound absorption material encased in the outer shell.

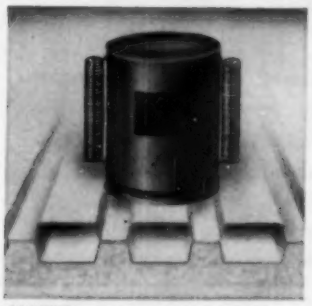
Resistivity to flow with this straight-through tube design is approximately equivalent to an equal length of straight pipe. Designed for easy installation on heavy duty applications, the unit is claimed leak-resistant with continuous welded shell seams, double-seal crimped ends and female pipe connections on both ends. Standard units, for service where air or gas is comparatively free from mois-

4-HOUR FIRE PROTECTION–FAST!

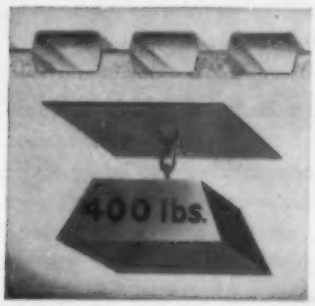
Now you can get a four-hour fire rating *sprayed on in one coat!* Gold Bond's new Fire-Shield Plaster gives cellular steel decks a four-hour rating when sprayed ⅜″ thick after the flutes are filled. Corrugated decks get this rating with a ¾″ coat following the contour of deck. Fire-Shield® Plaster goes on in one coat, sticks immediately to clean steel decks, and dries (without fissuring) with a bond stronger than the material itself.

See how this remarkable fireproofing plaster can cut costs on *your* next job. Ask your Gold Bond® Representative, or write direct to Dept. PE-460 for free samples and technical literature.

NATIONAL GYPSUM COMPANY, BUFFALO 13, NEW YORK



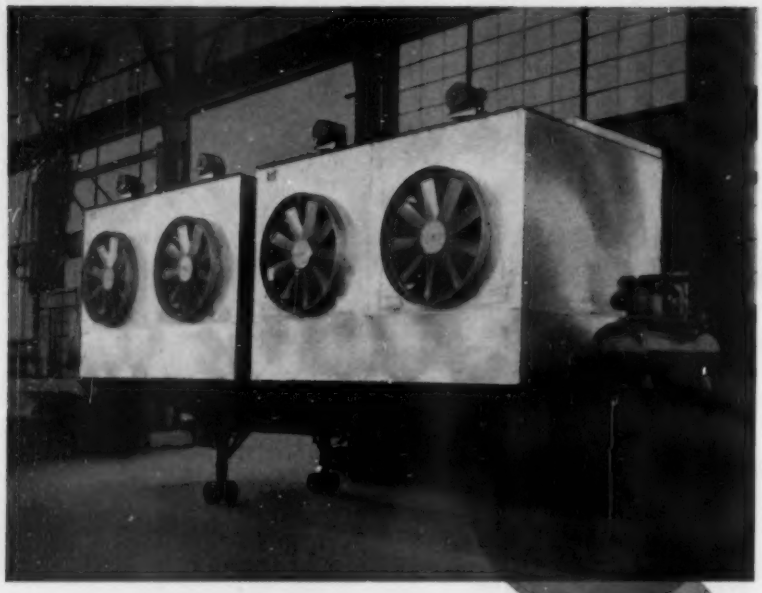
WET: Vibration torture test fails to shake loose a 4″ thickness of Gold Bond Fire-Shield Plaster, just five minutes after it's sprayed on.



DRY: Fire-Shield Plaster withstands a pull of 400 pounds per square foot without bond failure or separation of plaster from the deck.

Gold Bond BUILDING PRODUCTS ...a step ahead of tomorrow

For more facts circle 643 on Reply Card



Marley Cooling Towers produce Profits for Pea Pickers

Vegetable packers are insuring fresh arrival at market by processing in the field with a new type of portable precooling plant. A critical part of this processing is water cooling and conservation, a job entrusted to these two Marley dual Aquatowers. Here, again, is an example of the versatility of Marley cooling towers that protect and increase profits throughout industry.

In every plant, there are "hot spots" that Marley towers can change to "profit spots." They may be as obvious as air conditioning, refrigeration, or steam condensing—or they may involve special operations and equipment such as air compressors . . . welding equipment . . . molding presses . . . quenching . . . unusual seasonal or full-time processing demands. The point is that *any* service requiring 25 gpm or more calls for consideration of a Marley tower. Its initial cost, as well as installation and operating costs, is so low that it makes water wasting unprofitable—to say nothing of its effect on plant efficiency.

Types and capacities available are as varied as industry's demands. Pinpoint your "hot spots" today; then call your nearby Marley engineer or write for information on the only complete line of water-saving, money-saving cooling towers.

THE MARLEY COMPANY MARLEY KANSAS CITY, MISSOURI

For more facts circle 644 on Reply Card

NEW PRODUCTS

(Begins on page 186)

ture and temperatures to 210 F, come in 10 sizes from ½- to 4-in. pipe connections, up to 500 cfm capacity. Suggested applications are on the intake of high speed compressors, centrifugal and positive displacement blowers, and on the discharge of vacuum pumps, air motors and cylinders. Universal Silencer Corp.

77—VINYL BOOT protects terminating connectors

Zipboot is designed to be wrapped around any connector terminating a cable or assembly cable, then sealed with ZT sealer. Made of vinyl with a shrinking factor of approximately

30 per cent, Zipboot will shrink to a snug fit over connector and jacket of cable, says manufacturer, and when ends are properly sealed to connector and cable jacket, Zipboot prevents moisture from penetrating to interior of back shell. Thus potting may be unnecessary. The Zippertubing Co.

78—TRANSMITTERS are universal indicators

Model 45 Series of pneumatic indicating transmitters for pressure, flow, temperature, liquid level, differential pressure, and dew point feature measuring elements specifically designed for each major process variable. The transmitter is available with measuring elements in the following ranges: pressure—0-10 in. water to 0-80,000 psi; temperature—450 F to 1000 F (—270 C to 500 C); flow (differential pressure)—0-1 to 0-400 in. water; liquid level—open vessels 0-10 in. water minimum, closed vessels 0-20 in. water minimum; dew point— -50F F to 165 F. Output signal is 3-15 psi (3-27 psi optional). The transmitter operates on a 20 psi air supply. Manufacturer says the Model 45 has high ambient temperature stability, with less than ½ per cent error for ambient temperature changes as great as 50 F, regardless of variable measured, and overall calibrated accuracy within ±½ per cent. Featuring link and lever calibration and a minimum

NEW DRAW-OUT DESIGN
LIMITAMP* MOTOR CONTROL

INTERRUPTS IN ½ CYCLE

. . . protection when you need it—with Limitamp control

Rated 2300- to 4600-volts for a-c motors up to 3000 hp.

Here is performance you can count on . . . to start, stop and protect your motor under *your* environmental conditions!

General Electric's new draw-out Limitamp control is designed to interrupt in the first ½ cycle. Current is limited in the first ¼ cycle. EJ-2 fuses—the standard of excellence—give you this dependable short-circuit protection.

The new draw-out contactor is designed to give outstanding performance under all conditions of load—from small motors running light to large motors at "locked rotor." This improved performance comes from a new blow-out structure and an improved arc chute with superior extinguishing action.

The new contactor also meets a 60-kv base impulse level. Performance of the entire design has been exhaustively tested in General Electric's high-voltage laboratories . . . and, complete design coordination of bus, cable, current transformers, contactors, fuses, insulators and overload relays means top protection for men and equipment!

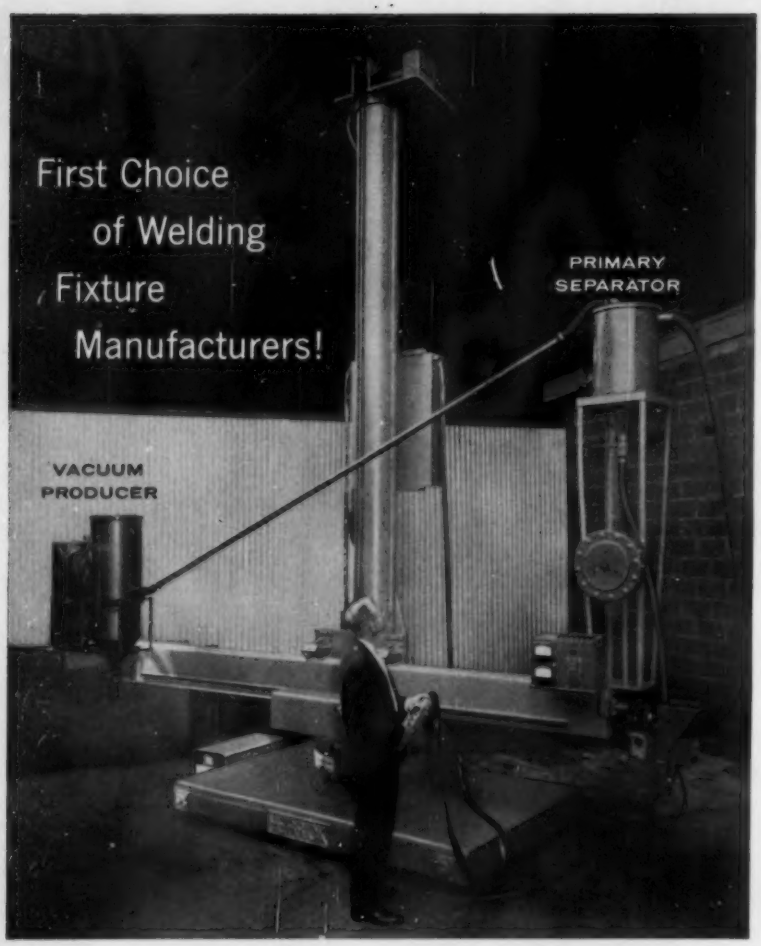
Ask your G-E Apparatus Sales Engineer or Agent about other advanced-design performance, maintenance, installation and operation features of new Limitamp control. Or, write Sect. 783-12, General Electric Co., Schenectady, N. Y. for Bulletin GEA-6893. Industry Control Dept., Salem, Va.

Progress Is Our Most Important Product

GENERAL ELECTRIC

* Reg. Trade-mark of General Electric Company

For more facts circle 645 on Reply Card



INVINCIBLE UNITS

Automatically Reclaim Flux

This automatic ram type manipulator made by C. B. Herrick Manufacturing Corp., Cleveland, is used for welding steel plate bridge girders. Mounted on the carriage, an Invincible Flux Recovery Unit travels with the welder along the full length (up to 130 feet) of the girder. It recovers all unfused flux . . . removes powder . . . and returns slag-free, dust-free flux to the welder automatically, in a continuous flow.

Fixture manufacturers—and users—specify Invincibles because they are engineered specially for handling abrasive materials and for continuous operation. Their rugged construction assures years of full-time operation—no loss of production time.

Savings in reclaimed flux alone pay their cost in a few months, even weeks. In addition, Invincibles save costly man-hours over manual methods, speed-up production, minimize rejects.

In 14 standard automatic and manual models (1½ to 7½ H.P.). Accurate free surveys of your submerged arc welding operations can be made on short notice. Resident engineers in all principal cities.

Send for Invincible Flux Recovery Equipment Folder.

INVINCIBLE VACUUM CLEANER MFG. CO.
DOVER, OHIO

For more facts circle 646 on Reply Card

NEW PRODUCTS

(Begins on page 186)

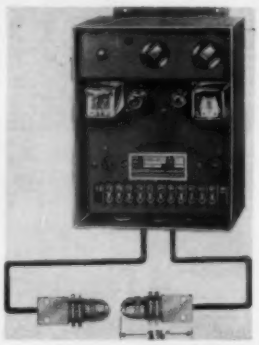
of moving parts, the Model 45 is said to be easy to adjust and maintain. Its 6⅛-in. scale and fluorescent pointer provide high-visibility local indication. Instrument components are enclosed in a weatherproof steel case. A universal bracket is supplied for surface or 2-in. pipe mounting. The Foxboro Co.

79—HAND TOOL SETS in heavy-duty chests

Three hand tool sets, complete with compact heavy-duty chests are announced for maintenance applications. The largest, No. 100-B, contains 94 tools including a wide range of sockets for handling a variety of work from ignition and carburetor operations to heavy jobs on trucks and tractors. No. 102-B contains 64 tools for automotive maintenance work, and No. 103-B, 2 contains 42 tools for general maintenance work. Owatonna Tool Co.

80—PHOTO CONTROLS with plug-in connection

Among operations performed by Robot-Eye are counting, sorting, inspecting, machine and operator safeguard, liquid level and bin level control, cut-off control, loop regulation and precision filling. Operation is by beam interruption or by reflection. Robot-Eye is flexible in construction. The three elements of the photoelectric system—light source, photo cell and



amplifier—may be interconnected by plug-in terminals and receptacles. Advantage of this design, manufacturer points out, is that it lets you select, from a variety of units, those best suited to job requirements, at minimum expense. Miniaturization and easy mounting are features of the light sources and photo cells. Units have clearance holes for flush mount, threaded bushing for panel mount, or

For more facts circle 645 on Reply Card

CLARAGE

"Packaged" fans . . . ready-to-run units for supply and exhaust jobs ranging to 25,000 CFM. Adjustable in-the-field to 8 discharge directions. Available for both outdoor and indoor installations. Send for 36-page catalog containing complete information or contact nearest Clarage sales engineering office.

CLARAGE FAN CO., 619 Porter St., Kalamazoo, Mich.

Please send your Ready Unit Catalog 517.

NAME _____

COMPANY _____

ADDRESS _____

CITY _____ STATE _____

Dependable equipment for making air your servant

CLARAGE FAN COMPANY

Kalamazoo, Michigan

SALES ENGINEERING OFFICES IN ALL PRINCIPAL CITIES • IN CANADA: Canada Fans, Ltd., 4285 Richelieu St., Montreal

For more facts circle 647 on Reply Card

NEW PRODUCTS

(Begins on page 186)

swivel base and ball joint for ease of alignment. Amplifiers come in tube or transistorized form. Amplifier flexibility is extended by provision for plug-in connection of time delays and count registers. Operating range of standard units is up to 20 ft. (This may be extended to 100 ft, if necessary.) Operating speeds are as high as 1000 per minute. A complete system may be had for under $60.00. Standard Instrument Corp.

81—COMPACT SWITCH for use on electrostatic precipitators

Although intended for distributing power from rectifiers to electrodes of electrostatic precipitators, this high voltage switch may also be used with other types of equipment having high voltage-low current characteristics. A multi-deck rotary type designed to operate in all types of insulating oils, it may be housed in its own compartment, in which it requires about 1 cu yd of space. Or it may be immersed in the same compartment as the transformer-rectifier, in which case the compartment is lengthened or widened.

Compact design results in a lower cost per se, manufacturer notes, as well as reduced space requirements when located indoors and less congestion in confined quarters when installed on the precipitator roof. It is pointed out that the totally enclosed switch offers freedom from corrosive effects of atmospheric elements and possible deposits of airborne dusts, as well as safety advantages, as personnel do not come in contact with live parts. The switch is engineered for 100,000 v and 1 amp. Switch action is double-blade type and large surface contacts are designed to withstand brief, but steep, feedbacks inherent in precipitator operation. Switch can be operated under load, if necessary. Buell Engineering Co., Inc.

82—STRIP COIL RACKS are modular, portable

Available in four standard sizes for coils from 24- to 42-in. diam, these strip coil racks have capacity up to 6000 lb. They are made of heavy

gaged formed channel with square tubular steel corner posts, each capped with locking nesting plugs for stacking. Illustration shows stacking of these racks with lift truck—the 3-in. underclearance permits fork-lift entry from all four sides. Also, the racks can be supplied with welded crane bails and braces to permit handling by overhead cranes. Jarke Mfg. Co.

83—EXPANSION JOINTS for tile, concrete floors

Flex-Tite Expansion Joints utilize a resilient rubber compound and metal designed to expand or contract with seasonal temperature changes, to eliminate cracking and crumbling at seams of terrazzo tile and concrete flooring. Manufactured in long strips, joints are composed of a synthetic rubber compound bonded between strips of durable zinc. The joint is half-submerged into cement as it is being poured. Terrazzo mixture, or tile, is laid on top of cement to height of expansion joint. According to manufacturer, it

POWERING

with Curtis compressors

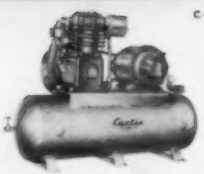
DEPENDABILITY
DICTATES USE IN VITAL APPLICATION

New facility acts as high-speed communications headquarters for metropolitan fire and disaster control.
Architects: Hellmuth, Obata & Kassabaum
Consulting Engineer: John O. Falvey

NEW FIRE ALARM CENTER IN ST. LOUIS SELECTS CURTIS EQUIPMENT "TO RING THE BELL"

C-126

Curtis air compressors were selected for two different jobs in this just-completed "nerve center." By pressurizing cables that contain 1,172 miles of underground telephone and telegraph circuits, communications are protected against water or other damage. Another Curtis compressor powers eight cleaning jets located at key points inside the Center.



Full line of compressors available 1/4 to 50 H.P.

Your applications different? Probably—but the rugged dependability of Curtis compressors is the point that applies to **your** operations, too. All tanks meet ASME specification: units have Curtis-Seal Crankcase, Adjustable Timken Tapered Roller Main Bearings, Self Centro-Ring Oiling, Air Cooling (no cooling water required). Write for Free Catalogs covering the complete Curtis line.

THE COMPLETE LINE OF HORIZONTAL AND VERTICAL COMPRESSORS • AIR CYLINDERS • PENDANT AIR HOISTS

Curtis MANUFACTURING COMPANY
PNEUMATIC DIVISION • *DEPT. 46, ST. LOUIS 33, Mo.* • *Established in 1854*

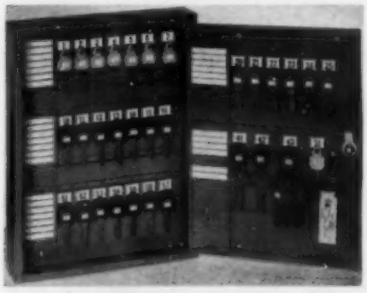
For more facts circle 648 on Reply Card

provides maximum resistance to traffic, moisture, oils, solvents and other deteriorating agents. The Firestone Tire & Rubber Co.

It's easy to obtain product data with the postage-free Reader Service Cards provided on pages 275-276. Use them for information on advertised products, too. Just circle the key number appearing at bottom of the ad.

84—KEYING SYSTEM with visual control by color

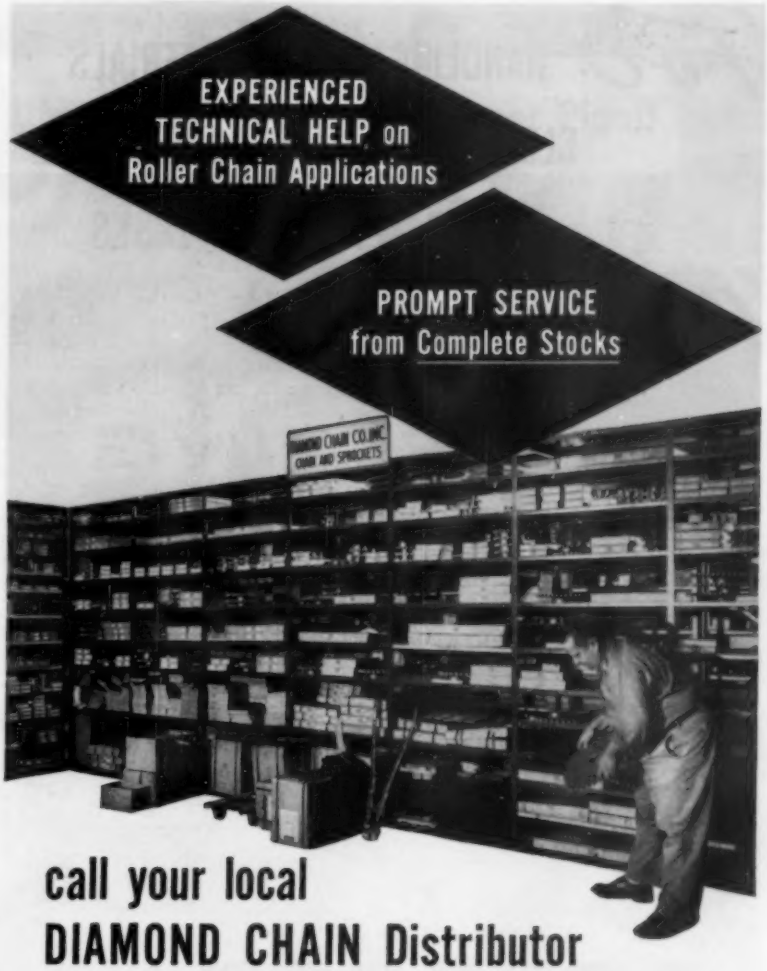
ColorCap is a keying system adaptable to installations with requirements from five to 99,900 keys. Basically, the system consists of pliable synthetic caps, in 10 colors, that fit lever and cylinder lock keys. ColorCaps, equipped with removable labels, are housed in steel cabinets providing hooks adaptable to keys of any shape or size. Standard labels are white, but colored ones are available to be slipped into the ColorCap pocket. The ColorCaps can be used to identify groups, floors, departments or other organizational requirements. Each cabinet



has a visible key index consisting of and includes key location cards to be hung on hooks from which keys have been taken to serve as receipts for keys in use. Saxton Barrett Co.

85—DUST, FUME SCRUBBER is compact, efficient

The Oriclone Scrubber is claimed to offer several advantages over most high energy collectors: 50 per cent less space requirement; higher operating efficiency at lower horsepower; adjustable orifice for maintaining peak efficiency when operating conditions vary; economy in first and operating costs; simplicity of design permitting economical alloy construction of use of protective linings; over 99 per cent efficiency even in submicron size range. According to manufacturer, the



call your local
DIAMOND CHAIN Distributor

Your DIAMOND Distributor can help you work out efficient, cost-cutting roller chain installations for power transfer, precision timing and conveying applications. He has, *in stock*, a good selection of DIAMOND roller chain and sprockets. He maintains large stocks of spare parts—connecting links, roller links—individually packaged in weatherproof, transparent plastic bags for easy shelving and identification.

Coast-to-Coast Sales and Service—Call your DIAMOND Distributor for *prompt service* for all your roller chain needs. Look under "Chains" or "Chains, Roller" in the Yellow Pages of your phone book . . . or write direct to DIAMOND for his name.

Catalogs and Engineering Service—Your DIAMOND Distributor can supply you with catalogs giving full information on roller chain and sprockets. Factory engineering service on special problems is also available through your DIAMOND Distributor.

DIAMOND CHAIN COMPANY, INC.
A SUBSIDIARY OF AMERICAN STEEL FOUNDRIES
Dept. 614 • 402 Kentucky Avenue, Indianapolis 7, Indiana
Offices and Distributors in All Principal Cities

DIAMOND ROLLER CHAINS ®

Find Your Nearest Distributor in The 'Yellow Pages'

For more facts circle 649 on Reply Card

For HANDLING "HOT" MATERIALS
•
CLEANING IN HAZARDOUS AREAS
•
OTHER "PROBLEM" TASKS

SPENCER

"Special" Portable Vacuum Cleaners

Units available for all types of difficult or dangerous cleaning requirements. Typical of Spencer "specials" are cleaners

- Without electric motors or wiring—powered from existing compressed air lines.
- Equipped with "absolute" filters.
- Of abrasion-resistant construction.
- With centrifugal, liquid immersion or bag type separation.

Check Spencer today on **your** special needs in a vacuum cleaner.

Request descriptive sheet on air jet cleaners, compressed air powered.

The SPENCER TURBINE COMPANY
HARTFORD 6, CONNECTICUT

For more facts circle 650 on Reply Card

NEW PRODUCTS

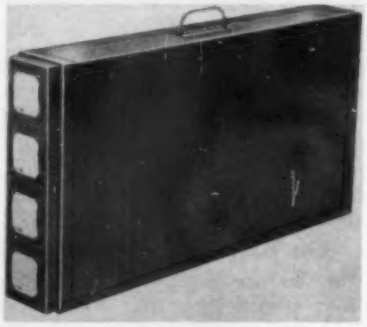
(Begins on page 186)

Oriclone Scrubber is one of the few wet collectors whose performance can match that of the electrostatic precipitator, and is suited for control of acid mists, tar fog, petroleum coke dust, fumes from metallurgical operations, catalyst dusts, other fine particles.

Compactness of the Oriclone results from the fact that the high energy at the orifice is used to atomize, agglomerate and separate the particles. Introduction of jets of water against the orifice plate, rather than in the throat of the inlet as in other orifice-type scrubbers, is said to result in improved water distribution across the orifice and reduction in power consumption, and consequently improved dust and fume separation. Company states also, that the Oriclone performs both agglomeration and separation in the one compact unit; there is no need for a subsequent collector. Overall dimensions of a 20,000-cfm unit, for example, are only 7 ft in diameter, 9 ft high. Units are available in capacities up to 40,000 cfm. For higher capacities, multiple units can be grouped together. The Ducon Company, Inc.

86—CARRY-FILE for plans and prints used on the job

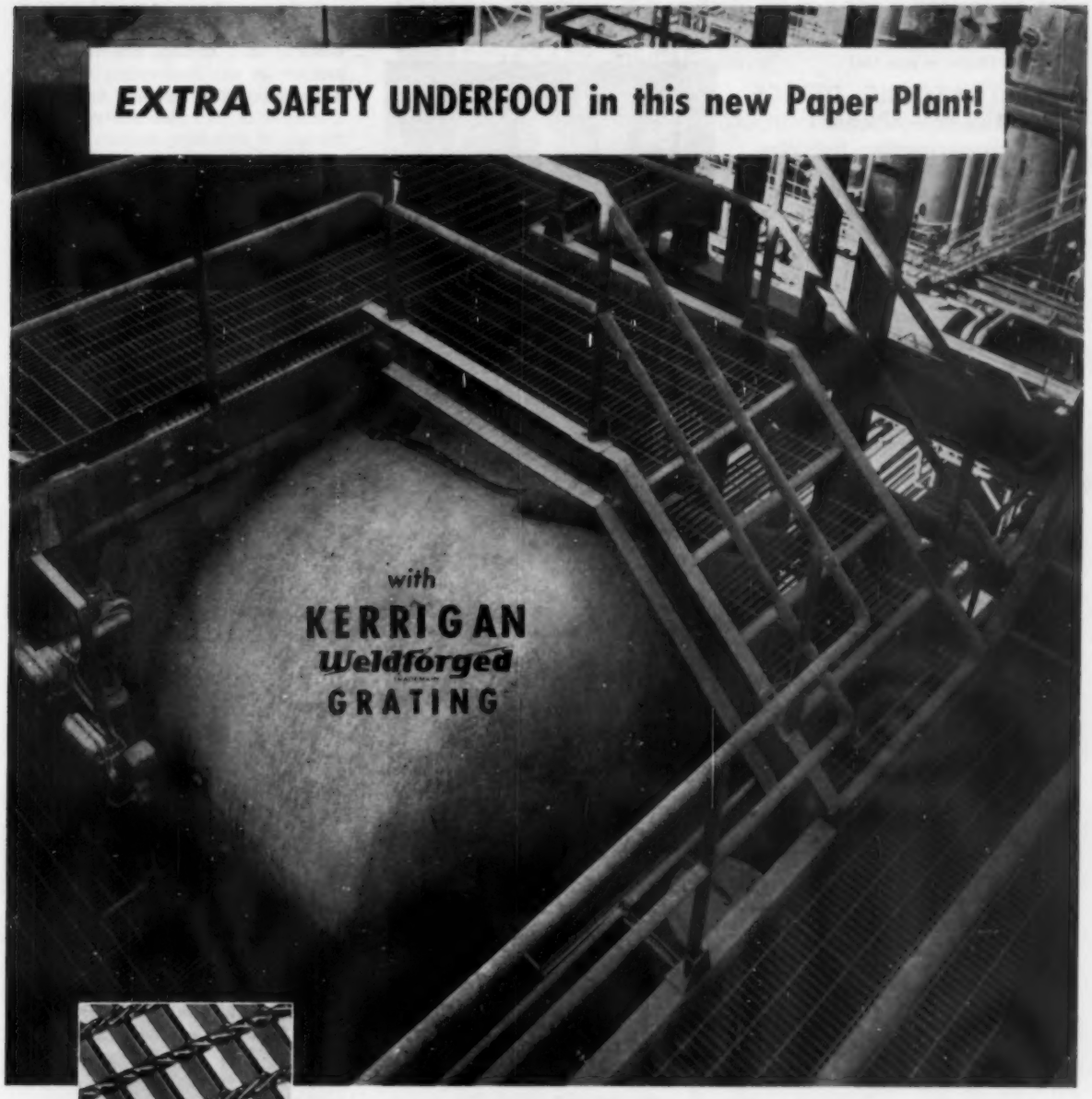
For those who use plans and prints at the job or in the field, the Roll-Pack consists of four durotubes mounted in a steel housing with a spring-latched door. The tubes are 2⅝ in. in diameter and 23½ in. long. The housing, with fold-away handle for

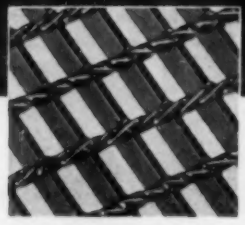


carrying, measures 12½ in. wide, 24¼ in. deep and 4½ in. high. It accommodates the standard 24-in. plan width by practically any length. A 30-in. size is also available. It weighs 8 lb, has capacity for four complete sets of plans, prints, maps or drawings. Prices start from around $11.00. Plan Hold Corp.

(Continued on page 254)

EXTRA SAFETY UNDERFOOT in this new Paper Plant!





TWISTED Cross Bars *ALTERNATE* right & left for an *EXTRA* margin of Walking Safety

When you specify Kerrigan Weldforged grating you get the utmost in underfoot and underwheel safety . . . in addition to its well known economy features. Bearing bars, and cross bars that alternate right and left, are electronically weld-forged into inseparable, one-piece units that stand up under the severest kind of punishment.

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KERRIGAN
IRON WORKS COMPANY
Nashville, Tennessee

Other KERRIGAN Products: GREULICH 4-Way Grid, Street & Highway Lighting Standards!

For more facts circle 651 on Reply Card

NEW PRODUCTS

(Begins on page 186)

87—ULTRASONIC DEVICE meters flow of liquids

This flow meter employs high-intensity sound waves—transmitted through the walls of the pipe to the flowing liquid—to measure quantity and rate of flow. Its development for water and sewage uses, co-sponsored by Hersey-Sparling Meter Co. and Gulton Industries, is expected to resolve problems of field testing present large water meters and checking flow in pipeline and fire protection systems already in service. The flow meter comprises

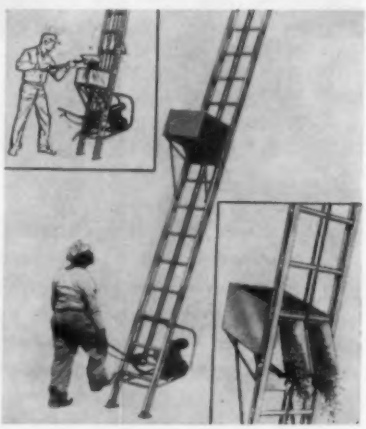
an insert pipe of the same internal diameter as the pipe to be metered with the transducers mounted thereon, a portable amplifier, and the readout. Readout and control panel may be located at any convenient site, and one readout may be used to monitor a number of pipe line inserts through the use of switching devices.

Principle involved is that of sending an ultrasonic beam across the stream and measuring the shift of the beam under the influence of the flowing liquid. Sound from the transmitting device (a Glennite piezoelectric transducer) echoes back and forth inside the pipe. Because of the shift of the beam, only a fraction of it is picked up by a sonic detector in the opposite wall of the pipe. This detector produces a small voltage which can be amplified and read on the voltmeter, and which varies with the velocity of flow in the pipeline. The flow meter is hooked up to remote control readout devices showing both rate of flow and total flow at any given moment. The ultrasonic devices are packaged in their own bronze or stainless steel pipe sections of standard diameters for insertion in pipeline. Bulletin S-9 gives data. Gulton Industries, Inc.

Reader Service Cards on pages 275-276 make it easy to get further information on any of these products. Just circle the item numbers of the products you would like to know more about.

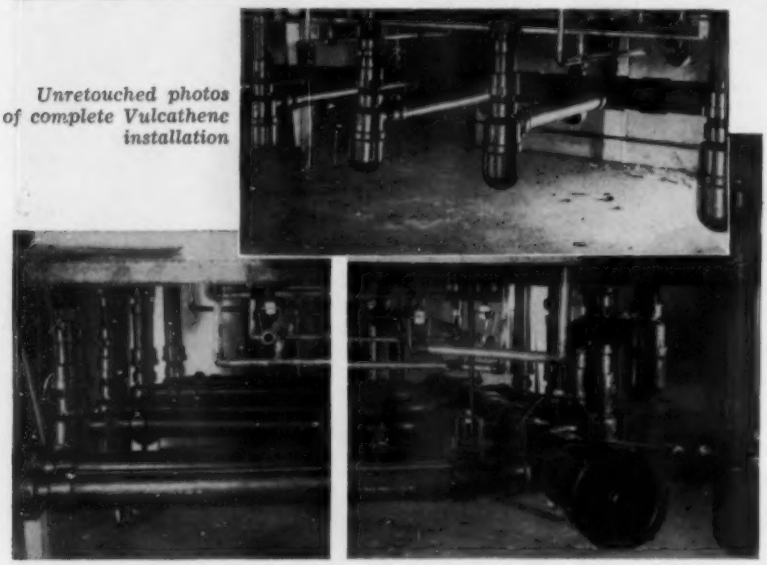
88—HOISTING LADDER has a self-dumping hopper

The self-dumping hopper on this hoisting ladder is designed to facilitate handling of sand, gravel and



other bulk loads, and to speed up-the-ladder movement of these materials at job site. Equipment includes an accelerator-type foot control for ele-

Unretouched photos of complete Vulcathene installation



for Maintenance-free Plumbing

Acid-Resistant **Vulcathene®**

Gives you the most practical and long-lasting plumbing yet devised for drainage

Besides being corrosion resistant and acid-proof, VULCATHENE plumbing has the definite advantage of being practically maintenance free. The inner walls of VULCATHENE plumbing are always *smooth*. There is *no scaling*. Waste and sludge flow through unimpeded. Nothing adheres.

Even after years of service VULCATHENE is still slippery smooth permitting the easy, *constant* flow of waste. That is why VULCATHENE installations remain in excellent condition *indefinitely* and require little or no maintenance.

For more information . . . kindly write Dept. P 2

American Vulcathene

P.O. BOX 965 ROCHESTER 2, NEW YORK

DIVISION OF THE NALGE CO. INC.

For more facts circle 652 on Reply Card

vating loads, a friction clutch to hold loads at any point, and manual drag brake for control on descent. Other features include non-slip safety feet, pin-locked rungs, and gasoline or electric power drive. Bush Mfg. Co.

89—FLEXIBLE HOSE for materials handling

Improved materials handling by gravity flow is promised by manufacturer of Duraflo hose, combining flexibility with exceptional resistance to internal abrasion. Made with a natural rubber inner liner, Duraflo hose has an outer cover of Neoprene coated fabric and is wire reinforced to maintain full capacity on bends. It is available in sizes 2 to 10 in. ID.Bulletin 601 gives details. The Flexaust Co.

90—WALL TYPE FILE holds drawings, blueprints

For handling and storage of blueprints, drawings and similar large sheet materials, the Martin Sheet File System lets plant engineers work with a large number of prints neatly and more efficiently because each sheet

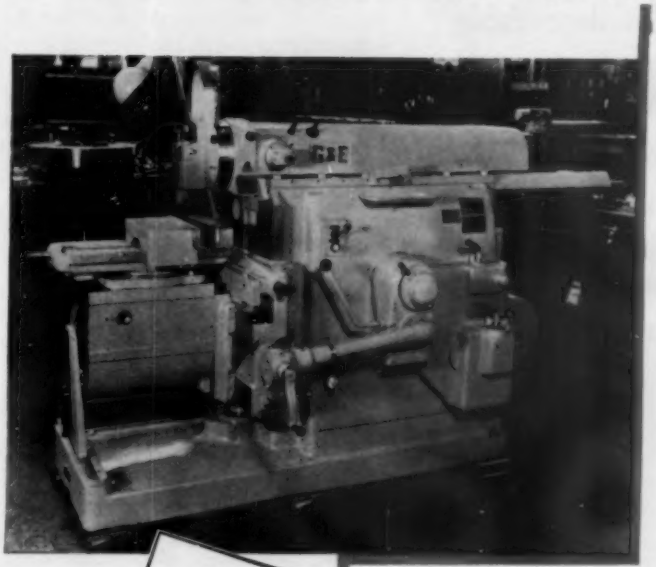
hangs flat. The file has a steel tube frame hinged to a plywood mounting panel, with locking hinge support arms. Rubber-tipped lock-clips are used to mount sheets in the clamp hangers. Many prints can be clamped in each hanger and may be removed at any time. Two sizes are offered: Model 30, sells for around $50, holds up to 30-in. width sheets; Model 42, for those up to 42 in. wide, costs under $65. Lewbill Industries, Inc.

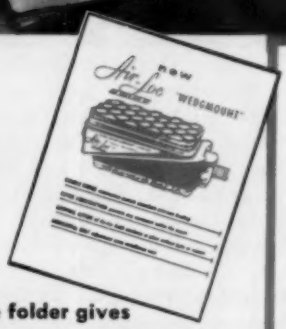
91—ELECTROSTATIC UNIT burns out odors

The Morris M-207 is a heavy-duty industrial electrostatic unit designed to handle odor problems in the average size room, approximately 20-by-20 ft. Electrostatic system burns out odors, company states, and requires no filters, lights, chemicals or other odor control methods. Electrical economy and trouble-free operation are chief advantages claimed for the M-207. Morris Deodorizers, Inc.

Can You Hold Your Shaper Without Bolts?

YES- with new WEDGMOUNT which anchors Shapers, Presses, etc. *and* permits precision leveling!





Free folder gives complete facts about WEDGMOUNT with—

- **"Air-Loc" patented vinyl, sisal and cork pads top and bottom grip machines to floors**
- **double-wedge construction which permits immediate precision leveling**
- **keyed construction which prevents movement within the mount**
- **sizes available thru distributors, and prices**

This Gould & Eberhardt 24″ Industrial Universal Shaper, operating at 120 cuts per minute with a 4″ stroke, is installed without bolts on a new type machinery mount called WEDGMOUNT. A dial indicator at the base of the shaper showed a total oscillation of only .022″ during operation, and no "walking." The 7,800 lb machine is installed on six WEDGMOUNTS, each type 3″ x 6″ S. Before operation, precision leveling is achieved by simple adjustment of a bolt within each mount. Top and bottom of each mount is surfaced with patented "Air-Loc" pads, which provide the high degree of friction required to hold the machine in place despite its strong lateral thrust, and greatly reduce transmitted vibration.

Air-Loc® WEDGMOUNT

write to... **Clark-Cutler-McDermott Co.**

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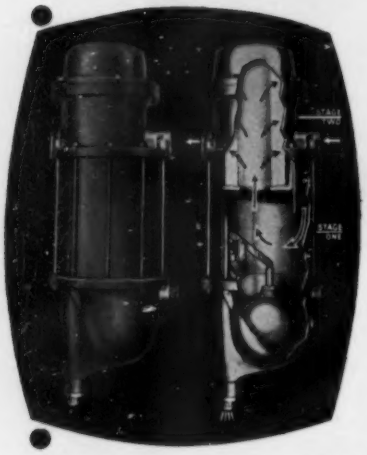
Use this dependable

WILKERSON

heavy-duty, float-draining

FILTER



Your paint sprayers, air cleaners, agitating devices, instruments and air tools are not delivering full profit potential if contaminants destroy efficiency and long life.

The Wilkerson ARID-AIR filter

- ★ Individual moisture-separating and filtering chambers provide 2-stage action which extends the life of the low-cost cartridge 4 times.
- ★ Automatically discharges up to 500 gallons of moisture per hour.
- ★ Removes particles as small as 3 microns in size.
- ★ Available from ½" to 2" P.T. up to 400 CFM with only 1.10 to 3.40 pressure drop. Maximum pressure 250 PSI.

WRITE TODAY

for complete ARID-AIR information contained in new catalog F158, and name of your nearest Wilkerson distributor.

WILKERSON CORPORATION

Dedicated to keeping the NEW in pNEUmatics

1638 West Girard Englewood, Colorado

For more facts circle 654 on Reply Card

Making the Most of Plant Space

(Continued from page 143)

hard glazed vitreous sewer. All areas in this section have 6-in. curbs.

For flooring on the working level, Grip-Strut grating was used. The contractor did a good job of installing this equipment. His supports were angle and tee irons set on adjustable jacks that had been dipped in plastisol. Special clamps and struts brace the floor. This type of flooring will permit aeration which will help reduce rust and corrosion. Tanks were set on acidproof brick (6 by 12 in.) and creosoted timbers. All piping was encased in Foamglas to stop erosion.

Several thousand feet of copper bus were required for this section. To reduce the amount of bus material to a minimum, a penthouse was built directly above the wet process area to house all rectifiers and generators. A deionizer was also located there, as were purification tanks for solutions.

Fresh air was pulled in across the rectifiers and then into a separate room housing the generators. This prevented the carbon in the air from the generators going into the rectifiers. All generators and rectifiers are cross-hooked so that in case of a breakdown other direct current equipment can be supplemented to keep the line running. The savings are already apparent in this area. Makeup air equipment was also housed in this penthouse.

In the final analysis, the time spent in the early stages by management, the plant engineer and the architect, has resulted in a good, operable building. **End**

"Well it should sound all right I haven't turned it on yet."

VALUE ENGINEERING PROVES

ROCKWELL *Resilient-Seated* Butterfly Valves *STAND OUT*

- Weigh Less—Cost Less
- Need Less Space
- Easier to Install
- Always Operable
- Low Pressure Drop
- No Fouling
- Negligible Maintenance
- Simplified Control —Manual or Remote

Bodies lined with any elastomer—from natural rubber to Viton.

Construction of any metal.

Operates from simple lever to automatic and remote control. No limit in size.

Let Bulletin 590X help you put value engineering to work on your valve applications. Just mail the coupon below.

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For more facts circle 655 on Reply Card

NEW!
SKIL RECIPRO SAW
2 SPEEDS FOR WOOD
AND METAL CUTTING

NEW! SKIL ½"
RIGHT ANGLE DRILL
USES SELF-FEEDING BITS

Two of the work-savingest tools you can own!

NEW SKIL RECIPRO SAW

Cuts anything that can be cut by hand—faster, easier and better. Does the work of keyhole, hack and handsaws 5 to 20 times quicker.

Two separate speeds—LOW for fast metal cutting with minimum blade wear, HIGH for wood and compositions.

Off-center blade cuts close to walls and corners—blade reverses in clamp for right or left situations.

Saves blades, too! When one section wears, shoe easily repositions for cutting with unused part of blade.

NEW SKIL RIGHT ANGLE DRILL

Lets you drill freely between joists and studding, in tightest quarters. And with new self-feeding bits you drill large holes —from 1¼" to 2⅛"—without bearing down on the tool!

Handles any drilling job—Right angle drive unit mounts two ways to give a low speed for boring large holes, or a higher speed for smaller holes. For straight-line drilling, simply remove unit. Comes complete with carrying case and 2⅛" self-feeding bit.

Ask your Skil distributor to demonstrate these work-saving Skil tools. He's listed under "Tools—Electric" in the Yellow Pages. Or write for full information to Skil Corporation, 5033 Elston Avenue, Chicago 30, Illinois, Dept. 1200.

SKIL ... and SKILSAW POWER TOOLS

For more facts circle 656 on Reply Card

For more facts circle 657 on Reply Card →

NEW PLANT CONSTRUCTION —advance information on location, costs

Ensley, Ala.—United States Steel Corporation's Tennessee Coal & Iron Division and Chemetron Corp. have announced joint plans for the construction of a plant for the production of rail sections by a new automatic welding system. Plant will be built on property made available by U. S. Steel's Tennessee Coal & Iron Division to Chemetron's National Cylinder Gas Division. Plant will be completed by the late summer of this year.

Fort Smith, Ark.—Borg-Warner Corp., 310 S. Michigan Ave., Chicago, Ill., plans to spend approximately $10 million for a new plant near here to meet expanding requirements of its Norge Division. New facility will be a 1,000,000-sq ft one-story building. Plant is scheduled to be completed late in 1961.

Los Angeles, Calif.—The Computer Division of Bendix Aviation Corp., Fisher Building, Detroit, Mich., will build a new manufacturing plant here to make the G-15 digital computer and transistorized computing equipment. Construction will get under way soon.

Forest Park, Ga.—Knox Glass, Inc., 1944 Penn Ave., Knox, Pa., plans to build a glass bottle manufacturing plant on large site near here. New plant will have a capacity of 200 tons per day and will have a working area of approximately 160,000 sq ft. The fully automated plant, designed for future expansion, will initially have two furnaces which will produce flint or plain glass and amber glass. Contract in the amount of $1 million has been let to McDonough Construction Company of Georgia, Inc., 1958 Monroe Drive, N. E., Atlanta, Ga. Plant is expected to go into production late this year.

Fort Wayne, Ind.—International Harvester Company, 180 N. Michigan Ave., Chicago, Ill., is building a 625,000-sq ft master depot for motor truck service parts on a 30-acre building site near company's Fort Wayne truck engineering laboratories. The depot will be equipped with automatic transportation equipment and will be ready for operation by late this year.

Indianapolis, Ind.—Western Electric Company, 195 Broadway, New York, N. Y., plans to construct a plastic molding plant at its Shadeland Avenue site, as part of a $5-million expansion program. The new plant will contain about 152,000 sq ft of floor space. When completed in mid-1961, the new plant will produce housings for telephone sets.

Warrick, Ind.—Aluminum Company of America, Alcoa Building, Pittsburgh, Pa., has announced that start-up operations at its 150,000 ton per year capacity smelter, near Evansville, Ind., is slated for June of this year. Company has delayed completion of the metalmaking plant for two years because of the excess aluminum capacity during the period of recession. This installation is estimated as an $80-million complex.

Harvey, Ill.—Allis-Chalmers Manufacturing Co., 864 S. 70th St., Milwaukee, Wis., plans a multi-million dollar expansion program of the company's engine production facilities located here. No specific cost figures were released but building industry observers indicated the cost at about $5 million. Plant will have 515,000 sq ft of floor area, bringing the total floor area at the Harvey Works to 1,169,000 sq ft. Facility will provide space for the manufacture of a broad line of diesel, natural gas, butane and gasoline engines. Work is already under way on

HOW YOU MAY CUT YOUR MACHINE FAILURES BY AS MUCH AS 25%

by J. R. RATCHFORD, Specialist, Lightning Arresters and Cutout Marketing

Experience shows that 25% of failures of unprotected rotating machinery are due to lightning.

With percentages like that against you, lightning and surge protection is imperative. The cost of this protection is a small fraction of the a-c motor or generator investment, and can be as low as 1/100th the cost of only one large a-c machinery repair. General Electric lightning protective equipment is available for all ratings of a-c machine operating voltages.

The Pyranol* protective capacitors in the G-E system provide turn-to-turn insulation protection by reducing the steepness of applied lightning surges and reflections within multi-turn machine windings. The Thyrite* Magne-valve station-class arresters protect the major (line to ground) insulation by limiting the magnitude of incident and reflected surges on the windings. Used in parallel, this combination effectively combats lightning-caused machine downtime and resulting repair costs.

May we show you specifically how you can protect your a-c rotating machinery? Contact your General Electric representative for full details or write to Sect. 435-24, General Electric Co., Schenectady 5, N. Y.

* Registered Trademark of the General Electric Company.

GENERAL ELECTRIC

General Electric Capacitor-

the new construction for completion late in 1961.

Calvert City, Ky.—Pennsalt Chemicals Company, Philadelphia, Pa., and Olin Mathieson Chemical Corp., Baltimore, Md., have announced the formation of a joint subsidiary to be known as the Penn-Olin Chemical Company. The subsidiary will produce sodium chlorate and other chlorate compounds used in the pulp and paper industry, in rocket fuels, and in weed killers. It will require an investment of $6.5 million to get the venture under way, including the cost of constructing a 25,000 ton per year plant at this location. Work will get under way as soon as preliminary engineering work is completed. Plant is expected to get into production late in 1961.

Plaquemine, La.—Dow Chemical Company, Midland, Mich., plans a $30-million expansion at its local facility here. Included in the works is a new plant for the production of ammonia, increases in production capacity for chlorine, caustic soda and vinyl chloride. Additions to existing power and steam generating facilities are also planned. Work will get under way at once and will take a period of two years to complete.

Detroit, Mich.—Kelsey-Hayes Company, 3600 Military Ave., Detroit, plans to build a 250,000 sq ft addition to a former jet engine plant of the company outside Detroit. A higher building was necessary to accommodate the company's big presses. The company will move its Detroit operations to the new facility in another year or so. Cost of the new addition is reported to be in excess of $2.5 million. Work will get under way at once for completion by the fall of next year.

Smithtown, Long Island, N. Y.—Lily-Tulip Cup Corp., 122 E. 42nd St., New York, N. Y., is constructing a large development and engineering center on a 30-acre building site on Commack Road, just off Northern State Parkway. Structure being built by K-Way Constructors, Inc., division of the Kretzer Construction Company, Inc., will have a floor area of 150,000 sq ft. Cost of new facility including equipment reported to be in excess of $1.5 million.

Clinton, N. C.—C. M. Hall Lamp Company, 1041 E. Hancock Ave., Detroit, Mich., plans major expansion program at its lamp manufacturing facility located here. New addition of 70,000 sq ft will double the size of its operation at this location. Plant is scheduled to be completed by this summer.

Muskogee, Okla. — Corning Glass Works, 1946 Crystal St., Corning, N. Y., plans a two-story addition to its plant located here which will give the company an additional 139,000 sq ft of manufacturing space. New addition to be completed late this year will increase production by 50 per cent. Work on the addition is already under way.

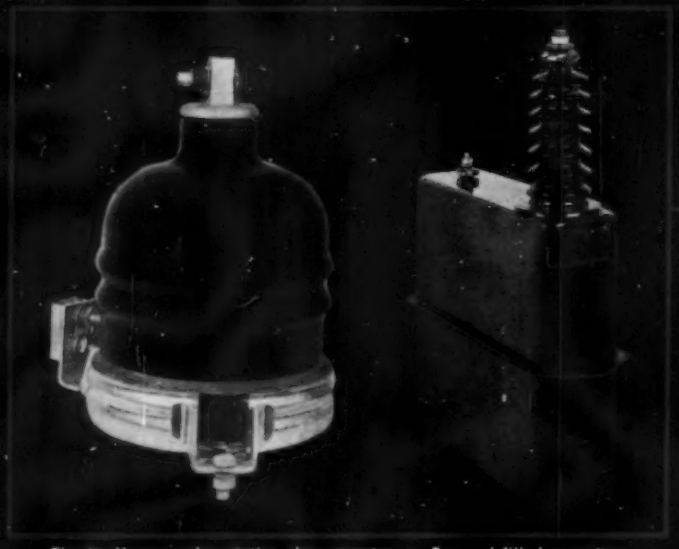
Portland, Ore.—Tektronix, Inc., 9450 S. W. Barnes Road, has announced a contract award to the Ross B. Hammond Company, 627 S. E. Division Place, also of this city, in the amount of $1.3 million for the construction of a plant for the manufacture of electronic parts. Work on the new facility is already under way and plant is scheduled to go into production early in 1961.

Ambler, Pa.—Sperry-Rand Corp., 30 Rockefeller Plaza, New York, N. Y., plans to construct an engineering center for the Remington Rand Division of the company to be located on a large site here. Building will contain 304,200 sq ft of floor space and is designed for doubling the capacity if and when needed. Work on the new plant is already under way and is scheduled for completion by the summer of next year. Cost is reported to be about $3 million with equipment.

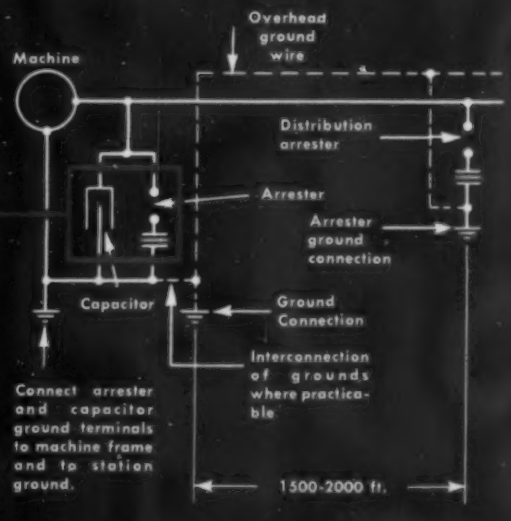
Conshohocken, Pa.—Alan Wood Steel Co., Wood Road, this city, plans a two year expansion program which will cost about $36 million. Company

(Continued on page 260)

Arrester Combination Gives You Low-Cost Lightning and Surge Protection for Your High Investment in A-C Rotating Machines



Thyrite Magne-valve station-class arrester Pyranol filled capacitor



Typical scheme of protection for machines connected directly to exposed overhead lines

GENERAL ELECTRIC

The Company that cares enough to give you the best!

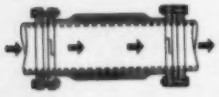
Massco-Grigsby

PINCH VALVES

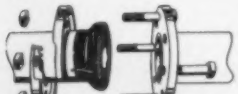
RUBBER, NEOPRENE for Corrosion and Abrasion

- 1" to 14" inside diameter.
- Pressures to 150 psi.
- Temperatures to 200° F.
- Patented "hinged" sleeve. Recesses serve as "hinges" during compression; reduce strain and permit tight closing.

- Cannot leak or stick.
- No working parts in contact with pulp or liquid; no packing glands.



- Unobstructed flow eliminates high friction loss.
- Remote control available.
- Can be equipped for automatic regulation.



- Split flanges and patented Flex Seal ends assure perfect seal.
- Closing mechanisms... manual handwheel; handwheel with chain and sprocket reduction unit; electric worm gear motor reducer; chain operated torque arm reducer; hydraulic; air-hydraulic.

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Manufacturing Division

MINE AND SMELTER SUPPLY CO.

3800 RACE STREET • DENVER, COLORADO
OFFICES AND AGENTS IN PRINCIPAL CITIES

For more facts circle 658 on Reply Card

New Plant Construction

(Continued from page 259)

has arranged financing in the amount of $30 million to be used for the construction of a new blooming mill and plate mill to replace present facilities. New blooming mill will be capable of rolling slabs up to 54 in. wide, while the plate mill will be able to roll plates up to 96 in. wide and 4 in. thick. Both installations are slated for completion by early 1962.

Pittsburgh, Pa.—H. K. Porter Co., Inc., Alcoa Building, this city, plans to spend approximately $4 million for new construction and modernization of company's refractories division plants at Bessemer, Ala., and Wellsville, O. About $2 million will be spent at Bessemer for new plant storage facilities, tunnel kiln, dryers and new brick-making units. At Wellsville, company's McLain Works, two new tunnel kilns will be installed at a cost of $1.5 million, along with other equipment. In addition, an estimated $455,000 expenditure is slated for a new mechanized clay mine to be opened late this year at the McClain Works.

Nashville, Tenn.—Ferro Corporation's Fiber Glass Division, Harvard and E. 56th St., Cleveland, O., plans a $2.7 million expansion program to include an additional glass smelting tank, fiber producing bushings, fabricating machines and a large warehouse area. Program which will be completed late this year follows a previously announced $700,000 expansion program now being completed. It is the third major expansion of the division in less than two years and brings to more than $4 million the total amount invested in fiber glass production.

Beaumont, Texas—Texas Gulf Sulphur Co., 75 E. 45th St., New York, N. Y., plans to construct a plant for the treatment of sulfur by filtration at its Spindletop Mine operation near here. Construction of the new facility is already under way with completion scheduled for mid-summer of this year. Cost of the new plant is reported to be $1 million.

Freeport, Texas—Dow Chemical Company, Midland, Michigan, plans major expansion of its polyethylene capacity at local plant here. Engineering for the new facilities has already begun and expansion will be complete by the summer of 1961. Polyethylene capacity will be increased by about 67 per cent.

Houston, Texas—Kaiser Gypsum Company, 1924 Broadway, Oakland, Calif., has taken an option on an industrial water front site in this city on which it plans to erect a gypsum building projects plant. Plant will cost upwards of $3 million and will start production in early 1961.

(Continued on page 262)

Parts Interchangeable **ON**

CHEMPRO "Wedge-Lock" EXTERNAL AND INTERNAL SEALS

Chempro "Wedge-Lock" Line of external and internal mechanical seals is now completely interchangeable in parts, with the exception of the stator bushing, for any given shaft size. This important cost- and time-saving feature is another Chempro FIRST, resulting in

- Savings through Reduction in Spare Parts Stock
- Gives You More Insurance Against Down-time

Chempro "Wedge-Lock" Seals give highly economical service on pumps handling acids, caustics and other liquids and slurries at temperatures from −80° F. to 500° F., from vacuum to 100 psi. Seal faces are always within the stuffing box, eliminating dangerous spray hazards.

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1. Simple In Design—Only 8 Parts
2. Installed In Only 20-30 Minutes
3. Seals Completely Interchangeable With Packing
4. Low Power Costs—Minimum Friction Load
5. Flushing, Cooling and/or Lubricating Can Be Supplied On All Seals

Write for Bulletins CP551 and 575

CHEMICAL & POWER PRODUCTS, Inc.

7 Broadway, New York 4, N. Y.

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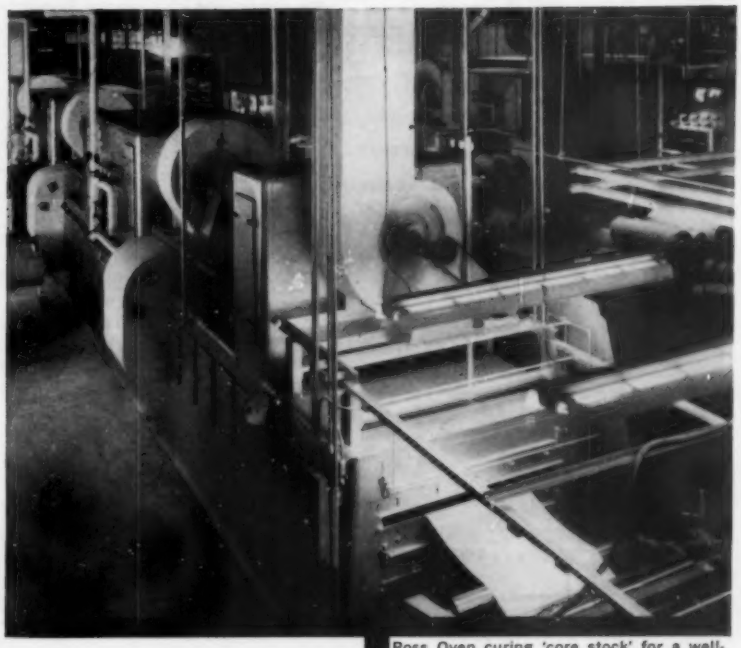
ROSS
Air Systems

Engineered Atmospheres for Better Processing



Ross Oven curing 'core stock' for a well-known cabinet top material.

variety of ovens

...a measure of engineering versatility

The ovens listed were designed, constructed and installed by J. O. Ross Engineering during the past few months. They are selected from an extensive list of Ross Oven sales to emphasize the essential engineering quality of versatility. Anyone can design an enclosure and blow in some hot air. Speaking broadly that could be called an oven. But note the distinctly different baking or curing requirements and the temperature levels required by the different operations. It's this close temperature work that calls for skilled and experienced engineering.

The other useful bit of information that this list emphasizes is that Ross Ovens are 'custom made' for each project involved. There are so many controlling factors that it would be very impracticable to try to fit any 'standard' oven to the work.

For that oven you are planning to install, your interests would be served best by having Ross versatile skill do the design, construction and installation.

1 ...FOR STRIP COATING LINE

continuous; 3-zone oven as one element of complete Ross/Waldron Strip Coating Line (aluminum); zone temperatures 200°F, 400°F and 650°F; critical timing within zones.

2 ...FOR AGEING ALUMINUM

batch; featured by Ross high velocity adjustable nozzles with special spacing to assure uniform temperature throughout the oven; input air at 500°F.

3 ...FOR CURING WELDING RODS

continuous; 3-pass, 5-zone baking oven followed by cooling zone, totalling some 200 feet in length; zone temperatures range from 70°F to 800°F; rate of moisture removal from the flux is extremely critical and must be closely controlled in the different temperature levels; timing as well as temperature control are vitally important.

4 ...FOR PROCESSING SPONGE RUBBER

continuous; designed for 1, 2 or 3 zone operations; maximum temperature 450°F. Zoning to take care of (1) sag or forming, a particularly critical step; (2) blowing or foaming; (3) curing, each at different temperature levels and all 'tricky' operations; permissible variations in temperature not over ±5°F.

M-R

J.O. ROSS ENGINEERING

Division Midland-Ross Corporation / 730 Third Avenue, New York 17, N. Y.

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They're strong . . . husky . . . made of 3/16" steel plate with continuous arc-welded seams. Also available in stainless steel or galvanized. Made in five sizes, ½ to 2 yard capacities, with live skids or a choice of wheels.

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1413 Woodland Ave., Detroit 11, Michigan

For more facts circle 661 on Reply Card

New Plant Construction

(Continued from page 260)

Houston, Texas—Sinclair Oil Corp., 600 Fifth Ave., New York, N. Y., and Koppers Company, Koppers Building, Pittsburgh, Pa., have announced a joint program to build a large petrochemical plant here. Construction of the facility will begin immediately and is slated for completion by the summer of 1961. Plant will be designed to produce 70 million lb of styrene monomer, a base chemical for the manufacture of plastics, synthetic rubber, and other products.

Danville, Va.—P. Lorillard Company, 119 W. 40th St., New York, N. Y., plans to construct a processing plant and warehouse facility here to cost in excess of $7 million. The new processing plant, expected to be in operation for the December 1961 crop, will have two production lines and room for a third. The new warehouse, expected to be ready for the December 1960 burley crop, will have storage space for 60 million lb of tobacco.

Plant Security

(Continued from page 120)

chandise by employees or others, should be reviewed with an eye toward making them as foolproof as possible.

No such system should be in the control of any one person.

All such systems should involve at least two people of middle echelon management and be established in such a way as to make collusion extremely difficult.

In establishing your security program, do not fail to consider some of the other valuable supporting services that are provided by some contract agencies. These would include the screening, with the polygraph (lie detector), of new personnel or applicants for sensitive positions. This method has proven most effective for weeding out undesirables and people with a previous history of dishonesty. The latest equipment and investigative techniques for solving security problems, including the use of undercover operatives, are also at your disposal.

We have found that a contract or "outside" guard service which knows security and has the facilities and supervision for effective training, reporting to the plant engineer, a person intimately familiar with the policy, problems and operations of his company, presents a most effective team for management. **End**

MAKE UP YOUR OWN V-BELTS...
IN ANY LENGTH
WITH
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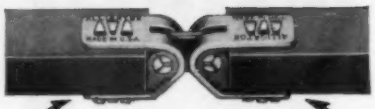
AND A LENGTH OF CROSS-WOVEN TYPE V-BELTING
(Available by the foot in A, B, BB, C, D & E sizes)



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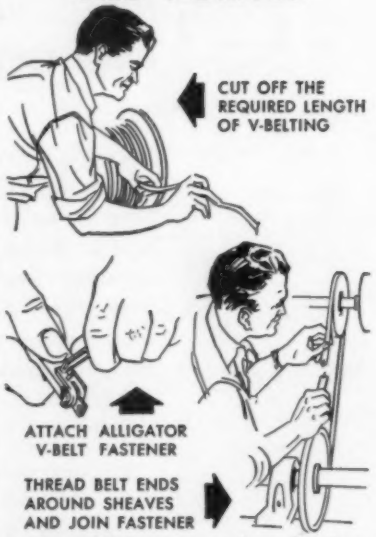
FAST & EASY INSTALLATION ON ALL V-DRIVES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ATTACH ALLIGATOR V-BELT FASTENER
THREAD BELT ENDS AROUND SHEAVES AND JOIN FASTENER

- About 40% lower in cost than other "connected" types.
- Can be installed around obstructions—machines do not have to be dismantled.
- Permit greater freedom in designing new drives.

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PROTECT thermal insulation with

				Bulletin Numbers
mastics	60-25/26	C. I. MASTICS	Asphalt vapor-barrier weathercoats	M-1-A/B
	*60-30N/60N	FIRE-RESISTIVE MASTICS	Non-asphaltic flexible weathercoat with non-flammable solvent	M-1-A/B
adhesives	81-13	ADHESIVE A-90	Brush-grade adhesive for low-density insulations	A-1-A/C
	81-33	FIRE-RESISTIVE ADHESIVE	Hard-setting for rigid high-density insulations	A-1-A
	81-42W	LAGFAS	Economical adhesive for lap-sealing and sizing canvas	A-1-B
	81-60	FIRE-RESISTIVE ADHESIVE	For blanket or high-density duct insulation	A-1-A/C
	81-63/66	INSULATION ADHESIVES	Low-cost brush and trowel-grade adhesives	A-1-A
	81-71/81	DUCT-FAS	Quick-tack with long-open time adhesives for duct insulations	A-1-A/C
	81-91	DUCT-FAS WHITE	For lap-sealing white vapor-barrier jackets on pipe covering	A-1-A/C
	82-18	DUCT-FAS QUICK-TACK	Fast-setting clear rubber cement for insulation facings and jackets	A-1-A/C
	*81-99	SAFETEE DUCT-FAS	Non-flammable, fire-resistive duct-insulation adhesive	A-1-A/C
coatings	30-42	VINYL VAPOR BARRIER	White vapor-barrier finish coat	C-1-A
	*30-36	SEALFAS	Light-colored fire-resistive, abrasion-resistant sealer	C-1-A
flashings	30-14	ASPHALT SEAM SEALER	Waterproof, good chemical resistance	F-1-A
	*60-30N	FIRE-RESISTIVE MASTIC	Non-asphaltic, non-flammable, non-bleeding, elastic	F-1-A

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The Bulletins listed on the right-hand column above are designed to help you solve specific insulation-protection problems.

For copies, simply note the numbers on this coupon and mail.

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Lightweight in all capacities—from ½ ton to 10 tons. Easy to install or move from one job to another. The half-ton weighs only 36 lbs.

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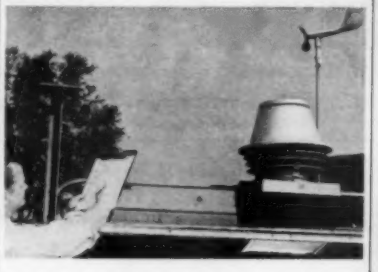
INDUSTRIAL FILMS

Insulation for Air Conditioning

LATEST RESULTS of a continuing study into the problems involved in insulating air conditioning systems have been incorporated into a sound, strip film titled "Building Weather." It is a non-commercial, technical presentation covering the development of normal inside design conditions along with a review of many of the problems involved in insulating air conditioning systems.

The film is based on the premise that outside weather data alone is no. accurate for use in predicting inside



ambient conditions. It further assumes that if we are able to reliably establish normal inside design criteria and can predict and/or eliminate those unusual conditions of excess severity, we can then more realistically and economically determine pipe insulation requirements.

Causes of moisture problems and a number of suggestions for eliminating or minimizing them, are given.

The Armstrong Research and Development Center has been working extensively on this problem for more than three years. The project has not been completed but has gone far enough to justify a full progress report.

"Building Weather" is available to interested groups by contacting Department BW, Armstrong Cork Company, Lancaster, Pa. It runs approximately 16 minutes.

Catalog of Industrial Films

SPECIALIZED MOTION pictures about new products, advanced industrial processes and cost-saving techniques are listed in a new revised edition of the "Business & Professional Film Catalog" published by Modern Talking Picture Service. The films are available on free loan to technical groups, universities, business and professional audiences and other groups.

All films are 16-mm-sound, varying from a quarter-hour to a half-hour in length. Subjects include research and

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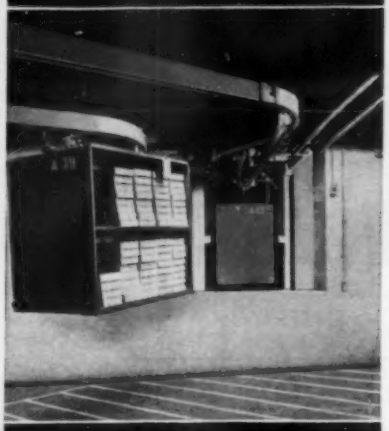
OVERHEAD CONVEYOR SYSTEM*



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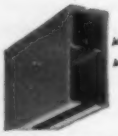
AUTOMATIC DISPATCH CONTROL

• *Simply set dials and Telematic guides carrier to any station in system*



Employs exclusive unitized "over and under" power and free rail which permits simple switching to right or left as desired.

Power-Flex is designed for automated materials forwarding applications in industrial plants, distribution centers, service buildings and department stores. The most economical system available for loads up to 600 lbs. per carrier. Savings in actual installations range from 25% to 60%.

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Engineered to your very specific requirements.

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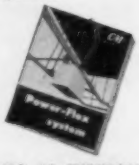
Inquiries from your engineers or consultants welcomed.



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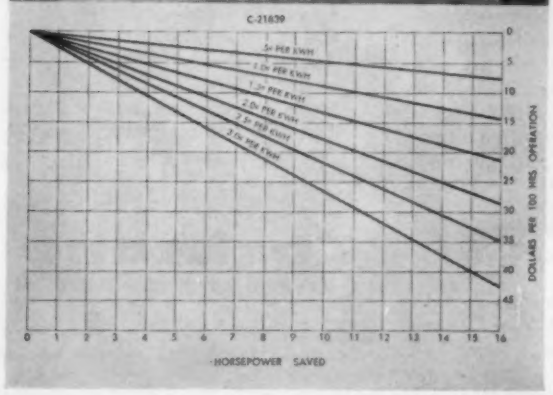

How do you know when you need a new pump?

"One way is to calculate power saving," writes Phil Olmstead, *Chief Engineer*, Goulds Pumps, Inc.

If your *needs* have changed since you installed your present pump, or . . .

If *efficiency points* have changed due to deposits building up in your piping, or . . .

If your present pump is *frequently under repair*, then . . . it's about time you began thinking about getting a new pump!

That's a pretty good rule of thumb to go by when the time comes to consider replacing an old pump with a new, efficient unit. But you don't have to rely merely on rules of thumb—you can actually *calculate* the power saving a new pump will bring you. Let me illustrate:

Only recently I discussed and demonstrated power saving with an engineer friend of mine. He had a pump that he had purchased five years ago. At that time its efficiency was high . . . but changing conditions led to reduced efficiency. According to the pump curve, its efficiency had dropped to 73 per cent: *600 gallons per minute @ 240 total dynamic head (pressure)*.

To prove a point, we went through the Goulds catalog and found a pump with the same rating but which was 82% efficient.

Next we merely applied the following formula to determine the brake horsepower:

$$BHP = \frac{\text{Gallons per Min.} \times \text{Total Head in feet}}{3960^* \times \text{Pump efficiency expressed as a decimal}}$$

*Horsepower conversion figure (foot-pounds to gallons per minute)

This is what we got:

$$\text{OLD PUMP: } \frac{600 \times 240}{3960 \times .73} = 49.8$$

$$\text{NEW PUMP: } \frac{600 \times 240}{3960 \times .82} = 44.3$$

HP SAVED: 5.5

Now check the savings chart illustrated on this page. Follow the "HP saved" line to the electric current rate line—in this case, 2¢ per KWH. The savings per 100 hours of operation would be approximately $10. At, say, 10 hours a day, 300 days per year, my friend saw that he would be saving around $300 with a new pump.

Try it for *your* pump. Calculate how much you would save with a new Goulds pump replacing your old one. Then call in a Goulds application engineer to talk it over and determine the *right* one for your needs. Or drop a line to me, Phil Olmstead, at Goulds Pumps, Inc., c/o Dept. **PE-40,** Seneca Falls, New York, and I'll see that you get the information you need.

GOULDS PUMPS

For more facts circle 666 on Reply Card

Wiley BOOKS

WORK IMPROVEMENT

By Guy C. Close, *Aluminum Co. of America.* This book's goal—increasing productivity with decreasing costs, through scientific application of work improvement methods. It presents the principles and tools of management, then shows in detail *how* these can be applied to actual situations, with examples drawn from an amazing variety of fields. Stress is on effective supervision to get practical results, by presenting techniques that have been *shown to work.*

1960 *464 pages* *$7.75*

AIR POLLUTION CONTROL

By W. L. Faith, *Air Pollution Foundation, San Marino, Calif.* Outlines all the problems in a nontechnical way and suggests approaches to solutions of this ever-present threat to health and safety. Presents all important factors, including:

• effects of pollution • relation of weather to pollution • air contaminants and their sources • measurement • auto exhaust and radioactivity hazards • legal aspects.

1959 *259 pages* *$8.50*

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INDUSTRIAL FILMS

development, modern steelmaking, plastics, die-casting, infrared spectroscopy, compressed air power application, forging and grinding techniques and other subjects useful in fields such as architecture, civil engineering, construction, the metal trades, the chemical and petroleum industries.

All the films are available on free loan as a public information service of leading businesses and industries. Modern Talking Picture Service will distribute the motion pictures from libraries in Atlanta, Chicago, Dallas, Los Angeles, New York and San Francisco. Copies of the catalog may be obtained by writing to Modern's headquarters at 3 East 54th Street, New York 22, N. Y.

Fire Protection

Availability of a 15 minute, color, sound film on the installation and operation of a foam-water deluge system of fire prevention and protection has been announced by the "Automatic" Sprinkler Corporation of America.

Showing the actual operation of a 60,000 gpm mechanical foam-water system, the film also portrays advantages of such a system applicable in the chemical, utility, aircraft and general manufacturing industries where special hazards involving the use of flammable liquids exist.

Requests for viewing, and inquiries concerning the film, should be directed to R. J. Buchanan, manager Special Hazards, the "Automatic" Sprinkler Corp. of America, Youngstown, Ohio.

Cost Reduction With Hydraulic Presses

A new 16-mm, sound color film on cost reduction and flexibility in industrial production through the use of hydraulic presses is now available.

Entitled "The Multi-Viewpoint," the film is a documentary on how tooling and production men are simplifying production operations with modern Multipresses. Press operations in a wide variety of industrial applications are shown, on both automatic and semi-automatic operations. The advantages of hydraulic presses to plant layout, high production, versatility and cost reduction are analyzed.

A descriptive folder and order blank may be obtained from Denison Engineering Division, American Brake Shoe Company, 1160 Dublin Road, Columbus 16, Ohio.

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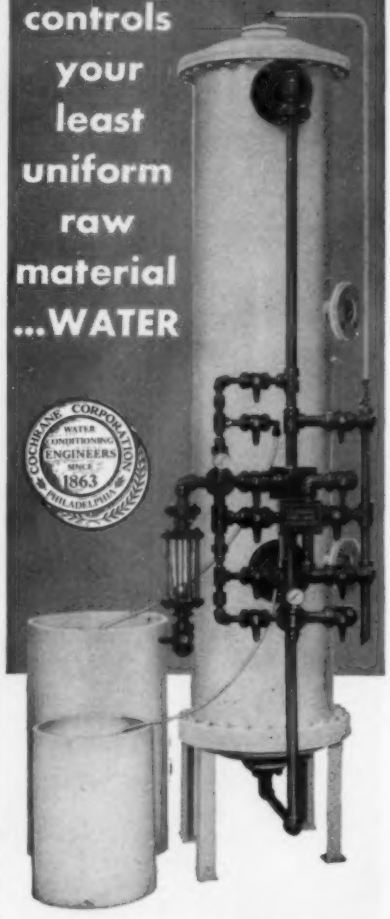
controls your least uniform raw material ...WATER



Are seasonal changes in the mineral content of your water supply a costly headache? Maintain quality standards year round with this *new* Cochrane Uni-Pac Packaged demineralizer, designed expressly for process systems. Sizes to 3500 GPH factory assembled, easily installed and operated. Send for Publication 5819.

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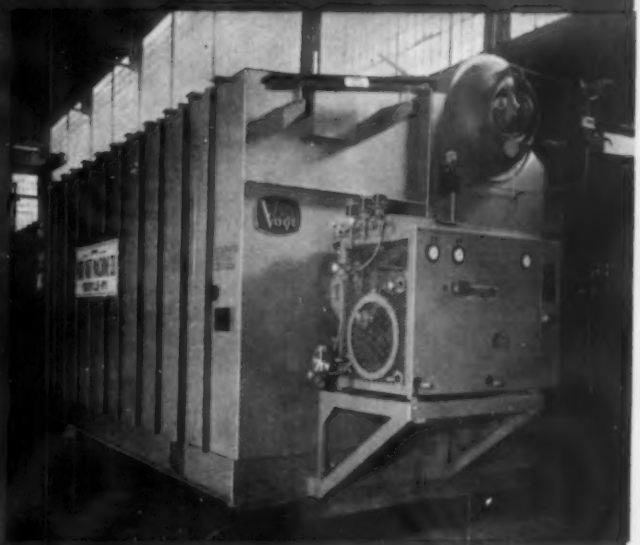
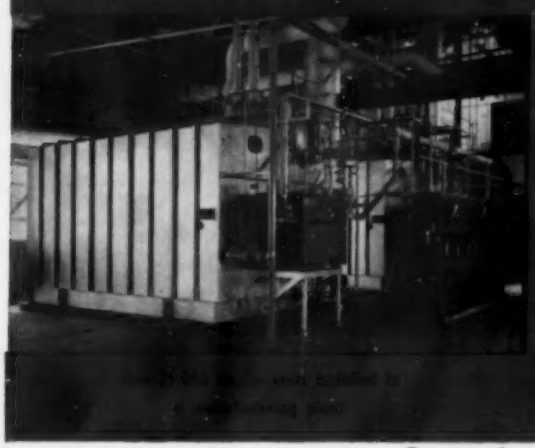
Completely shop fabricated, with burners, controls and accessories installed before shipment.

Placed on a suitable foundation, only fuel, water, breeching and steam connections need to be made to place unit in operation. Vogt Package boilers are available in oil and/or gas fired types in standard pressures of 175, 250 and 375 pounds per square inch gage.





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Wiremold Air Duct just doesn't need cuffed ends, attached cuffs, or any kind of cuffs or cuffing equipment.

Unlike any other duct — a **flat** metal spiral locks mechanically to the fabric — makes it cuffless and always ready to hook up, simply by sliding it over the end fitting. Fasten it with a sheet metal screw through the flat spiral — only possible with Wiremold — or secure it with a clamp. The flat spiral fits snugly against the fitting and won't slip out of place. Coated with cement, the hookup will be airtight.

Wiremold saves time and money on **every** connection. Find out more ways to save — send for new folder.

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NEW BOOKS

for the plant engineer

Plastics Source Book

SOURCE BOOK OF THE NEW PLASTICS by Herbert R. Simonds. Size 9¼ by 6¼ in.; 354 pp including index; illustrated; cloth bound. Published by Reinhold Publishing Corporation, 430 Park Avenue, New York 22, N.Y. Price $10.00.

THIS BOOK fits its title; it details the new plastics and developments in some of the more familiar ones, giving properties and availabilities of each. For sources, sixty plastic producers have prepared articles on their own materials—including seven new primary plastics, acetal resins, ethylene oxide, methylstyrene, polyacrylamides, polycarbonate, polyether and polypropylene.

Also included is a report by the Department of Commerce—the first and only survey of federal-sponsored research on plastics.

Whatever your interest in new plastics, their properties and their producers, this book supplies most of the answers.

Fluorescent Lighting

FLUORESCENT LAMPS AND LIGHTING. Size 9⅛ by 6 in.; 346 pp including index; illustrated; cloth bound. Published by the Macmillan Company, 60 Fifth Avenue, New York 11, N. Y. Price $11.00.

FLUORESCENT LIGHTING is a topic that is probably of various degrees of interest to a vast audience in industry and commercial activities. Much has been accomplished in improving the application of this type of illumination but more work remains to be done. Of course, to do this work well and/or to recognize good use of this type of lighting it is essential that one have a good knowledge of fluorescent lighting technology.

In this book, which is part of the Philips Technical Library group, there is a comprehensive treatment of fluorescent lighting starting with a fundamental discussion of the nature of light and later taking in such subjects as the theory of fluorescence and phosphorescence of solids, the fluorescent coating in lamps, electroluminescence, choice of colors for general lighting fluorescent lamps, the current-voltage characteristic and ignition.

The foregoing are some of the items discussed under headings in the

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A HIGH QUALITY LINE OF MALLEABLE HOUSED BEARING UNITS AND BEARINGS AT A COST THAT IS WARRANTED ON YOUR MACHINE!

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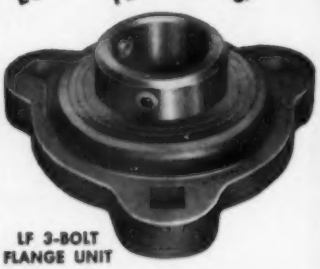

LF 3-BOLT FLANGE UNIT

Available in pillow blocks and two or three bolt flange units for flush or recessed mounting. All units in the "L" Series available with the new SEALMASTER contact type seal.

LP PILLOW BLOCK

LF FLANGE UNIT

LFT FLANGE UNIT

WRITE FOR BULLETIN 359

SEALMASTER®

SEALMASTER BEARINGS
A DIVISION OF
STEPHENS-ADAMSON MFG. CO.
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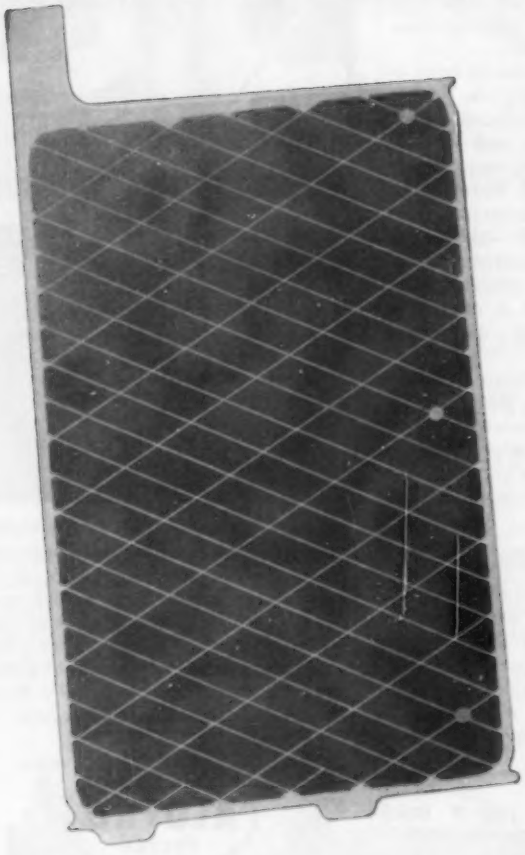
PLANTS LOCATED IN: LOS ANGELES, CALIF. CLARKSDALE, MISS. • BELLEVILLE, ONTARIO

For more facts circle 671 on Reply Card

NEW GOULD *SILCONIC* PLATE Increases Battery Life 25%-FREE!



A vital contribution to motive power batteries, Gould's NEW Silconic Plate prevents grid corrosion, the most common cause of battery failure.

Sound, tested and proved, the principle is simply this: Gould introduces silver and cobalt into active materials of the positive plates. The silver and cobalt migrate to—and collect on—positive grid members, forming an insoluble oxide surface impervious to acid and oxygen attack. The longer the battery operates, the deeper the silver-cobalt penetrates into the grid metal, thus greatly prolonging life. In applications where batteries are idle for periods of time, Gould's Silconic Plate prevents migration of materials to the negative plate, effectively reducing self-discharge within the cell.

Further overall strength is achieved when arsenic is added to the antimonial alloy of the plate, resulting in an extremely dense, homogeneous grid free of flaws. This new physical and chemical strength—together with Gould's compact battery design—add up to the best motive power battery you can buy. Write today or call your local Gould representative. He's listed under "Batteries Industrial" in the yellow pages. Gould-National Batteries, Inc., Trenton 7, N. J. *IN CANADA, WRITE TO GOULD-NATIONAL BATTERIES OF CANADA, LTD., 1819 YONGE STREET, TORONTO, ONTARIO.*

More Power to you from **GOULD**

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EASY-TITE
Note imbedded Nylon plug — locks screws automatically
Note Fiberglas backing — resists closing squeeze

New Way to Stop Faucet Leaks!

★ 9-in-10 washers are fastened with TOO LONG or SHORT SCREWS thus loosen and destroy themselves. Leaks quickly follow!

34 YEARS OF RESEARCH REVEALS NEW SOLUTION

★ New, patented 'Sexauer' SELF-LOCK screws have imbedded expanding NYLON PLUG. They lock at required depth AUTOMATICALLY, hold washers firmly! Made of MONEL, they are rustproof, non-corroding. Heads can't twist off. Screw slots can't distort.

★ NEW, improved 'Sexauer' EASY-TITE faucet washers are made of super-tough, pliable du Pont compound (not rubber or fibre). Reinforced, like a tire, with a vulcanized layer of Fiberglas, they resist distortion and splitting from shut-off grind and squeeze.

★ Faucet leaks repaired with 'Sexauer' EASY-TITE washers and SELF-LOCK screws outlast ordinary repairs "6-to-1"!

HIDDEN COSTS OF FAUCET LEAKS!

Hackensack, N.J. Water Co. and American Gas Association figures prove stopping just ONE PIN-HOLE SIZE (1/32") LEAK saves you 8,000 gal. water quarterly. A HOT WATER FAUCET LEAK repair saves you over $7.58 QUARTERLY in fuel and water bills. Fewer leaks also produce important savings on MATERIALS, LABOR and COSTLY FIXTURE REPLACEMENTS!

A 'Sexauer' Technician will make available our NEW Catalog, Edition "J", listing our entire line of over 3,000 TRIPLE-WEAR plumbing repair parts and tools. He will survey your fixtures, determine the repair parts needed and establish an efficient stock arrangement and control to prevent costly overstocking or shortages. You get this service without obligation. *Act now!*

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NEW BOOKS

first four chapters. Additional subjects are treated in ensuing chapters having the following titles: lamp construction; factors affecting the efficiency; stabilization of the discharge; lamp types and circuits; ballasts for A.C. operation fluorescent lamp fittings; progress in lighting; and application of fluorescent lamps. A brief treatment of transistor circuits appears in the appendix.

On Instrument Servicing

INDUSTRIAL INSTRUMENT SERVICING HANDBOOK by Grady C. Carroll. Size 9¼ by 6¾ in. approx.; 848 pp; illustrated; cloth bound. Published by McGraw-Hill Book Company, Inc.. 330 West 42nd St., New York 36, N.Y. Price $16.00.

THE INSTRUMENT and control field encompasses a complexity of equipment that is staggering; this handbook puts a good bit of helpful light on the intricacies of this type of apparatus. In it the author systematically has presented information on the operation, servicing and maintenance, and calibration of a variety of units. This book can be of value to engineers, technicians and students.

Types of instruments dealt with in seven of the thirteen sections pertain to the measuring of: pressure; differential pressure; velocity and volume; liquid level; temperature; viscosity and specific gravity; pH and Redox. Topics of the following five sections are: gas analyzers; control valves and positioners; speed measurement and control; repairing and calibrating controllers; and organization of instrument department for processing plants.

The last section contains a collection of tables giving thermocouple temperature-millivolt equivalents. The book also contains troubleshooting charts which can be an aid in cutting down time spent in locating difficulties.

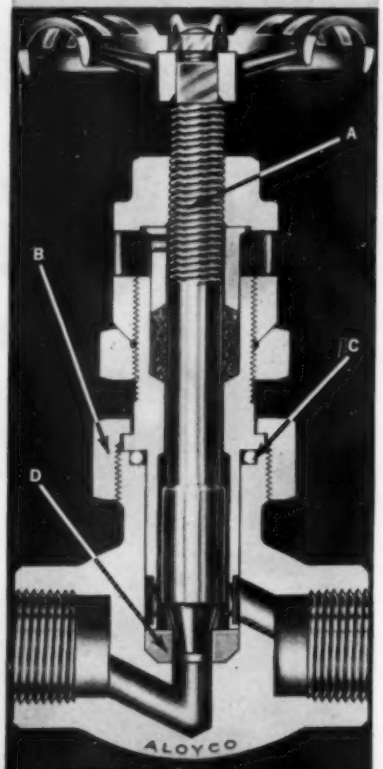
Plastics Application Series

Volumes nine and ten in Reinhold's plastics series are now available. The same size (7½ by 5½ in.) as those preceding them, and much like them in format, these books deal with two additional families of plastics. They are available from Reinhold Publishing Corporation, 430 Park Avenue, New York 22, N. Y.

AMINO RESINS by John F. Blais. 220 pp including index; price $4.95.

PROBABLY BEST known in their melamine tableware form, the amino resins are finding application in

Stainless Steel* Aloyco Needle Valve eliminates leakage and galling!



A. OUTSIDE STEM THREADS are away from corrosive area prevent galling.
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D. TEFLON SEATS are pressure-tight, dependable, won't gall. Renewable.

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This #62 Stainless Steel needle valve has proved itself for 10 years in many types of severe corrosive service. It is particularly suitable for sensitive control of flow as in metering, or sampling for process plant, laboratory or pilot plant use. For more facts write: Alloy Steel Products Company, 1308 West Elizabeth Ave., Linden, New Jersey.

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ALLOY STEEL PRODUCTS COMPANY

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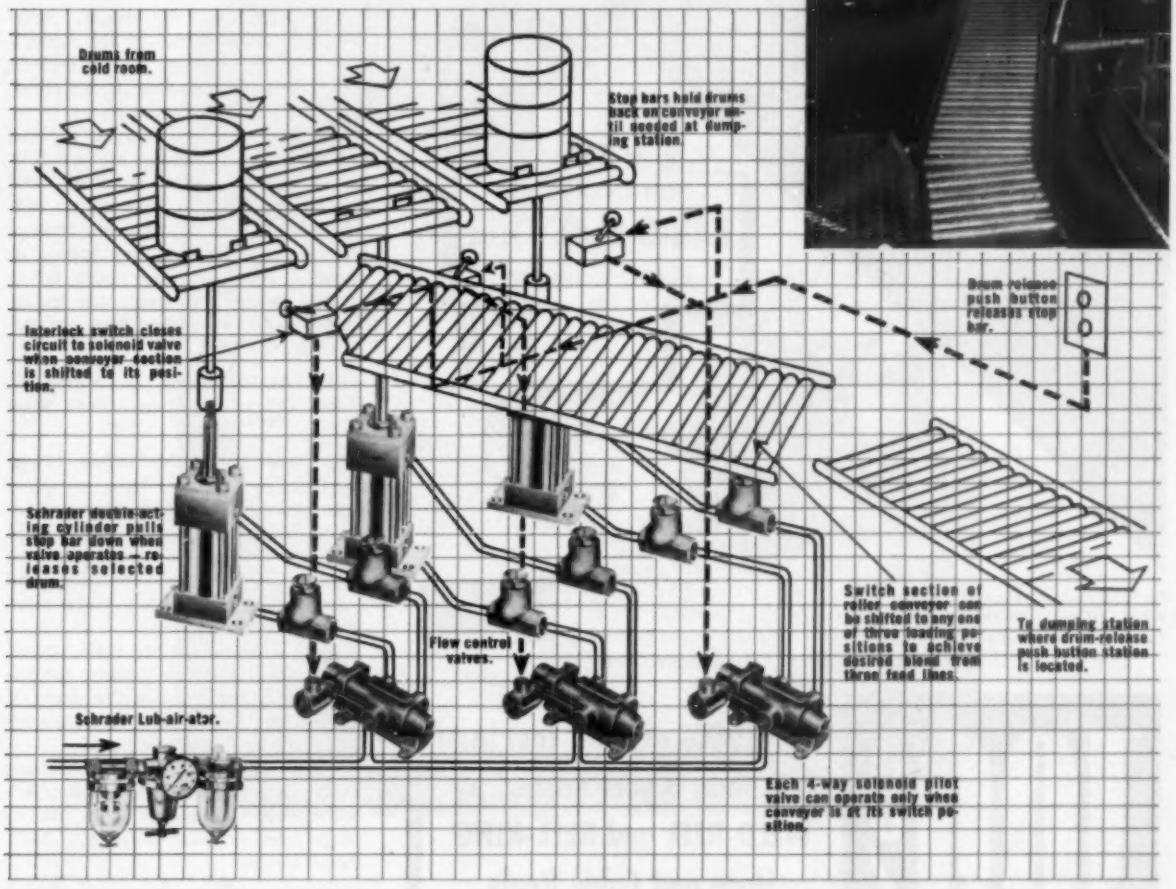
Processors automate even heavy work with air. In a complex frozen juice concentrate blending operation, Plymouth Citrus Products Cooperative, Plymouth, Fla., hooks up Schrader Air Products simply and economically to a gravity conveyor. Full 55-gal. barrels on feed sections roll down to stop bars and are selected in correct order and ratio for dumping. "The Schrader system performs well," says C. Byron Smith, plant manager. "We're handling 200 to 300 barrels a day on this selective conveyer, and could handle more."


Drums from cold room.
Stop bars hold drums back on conveyor until needed at dumping station.
Drum-release push button releases stop bar.
Interlock switch closes circuit to solenoid valve when conveyor section is shifted to its position.
Schrader double-acting cylinder pulls stop bar down when valve operates — releases selected drum.
Flow control valves.
Switch section of roller conveyor can be shifted to any one of three loading positions to achieve desired blend from three feed lines.
To dumping station where drum-release push button station is located.
Schrader Lub-air-ator.
Each 4-way solenoid pilot valve can operate only when conveyor is at its switch position.

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Solve difficult problems of handling, conveying and sorting, just like this company . . . with air! Versatile Schrader Air Products take punishing environments in stride, even corrosive atmospheres . . . Work together like magic on American production systems of many different kinds in hundreds of industries.

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Select from the full Schrader lines to plan your automation of machines. Your Schrader distributor can help you pinpoint what you need. For more data write:

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QUALITY AIR CONTROL PRODUCTS

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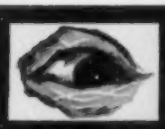

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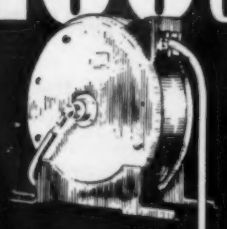

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NEW BOOKS

adhesives, laminating, molding and surface treatments for textiles and paper products.

This book traces the history, chemistry and manufacture of the various resins in the family, which include urea, melamine, aniline urea, ethylene urea and guanamine resins.

In addition to the familiar molded products, amino resins are used to make textiles water-repellent and wrinkle-resistant, to give paper wet strength, and as enamels for coating metals. As adhesives, they appear in plywood, furniture, flush doors, boats, particle boards and bag seam pastes. These and many other uses are detailed in the text.

ACRYLIC RESINS by Milton B. Horn. 184 pp including index; price $4.50.

IN THIS BOOK, the author brings together, for the first time, complete information on all four types of acrylics. The manufacture, fabrication and application of cast products, molding compounds, emulsion and solution compounds are given nontechnical coverage.

Most familiar in its rigid, transparent sheet form in glazing, the acrylic family finds use in the sizing of textiles and paper, and in emulsion-based paints for interior use.

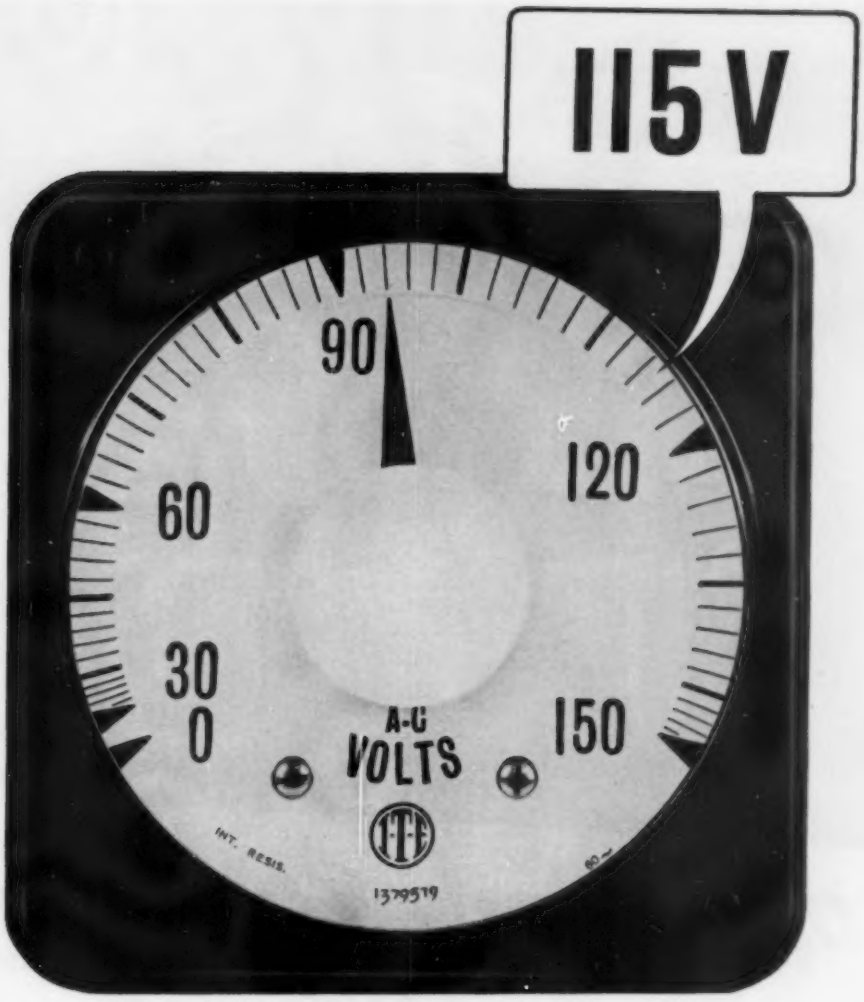
Floor waxes and leather coatings are volume users of the acrylics; adhesive applications of the plastics range from pressure-sensitive to hard, fused bonds.

CONSTRUCTION BRIEFS

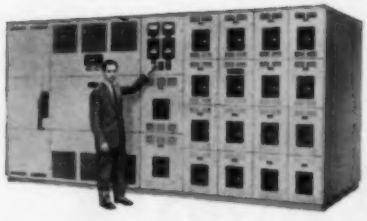
This series of articles, which has appeared bi-monthly for the past five years, is available in a set of booklet reprints. The first four cost 50 cents apiece, the last one 75 cents . . . for a total of $2.75 for the set.

The first booklet discusses beams, reaction, bending moment, shear, moment of inertia, and section modulus; the second, deflection, horizontal shear, floor loading, framing, columns; the third, columns, trusses, connections, welded connections; the fourth, fastenings for timber and a four-part series on the structural design of an industrial building; the fifth, a seven-part series on designing in reinforced concrete.

For any one, or all of these "refresher" booklets, address the Editor, Plant Engineering, 308 E. James St., Barrington, Illinois.



"But I was positive we didn't need another substation!"



MORAL: For good voltage regulation and better operating efficiency, put a secondary unit substation in each load area. And for complete information on today's most value-packed line of substations, write for Bulletin 3104-1A, I-T-E Circuit Breaker Company, Dept. SW, 1900 Hamilton Street, Philadelphia 30, Pa.

I-T-E CIRCUIT BREAKER COMPANY

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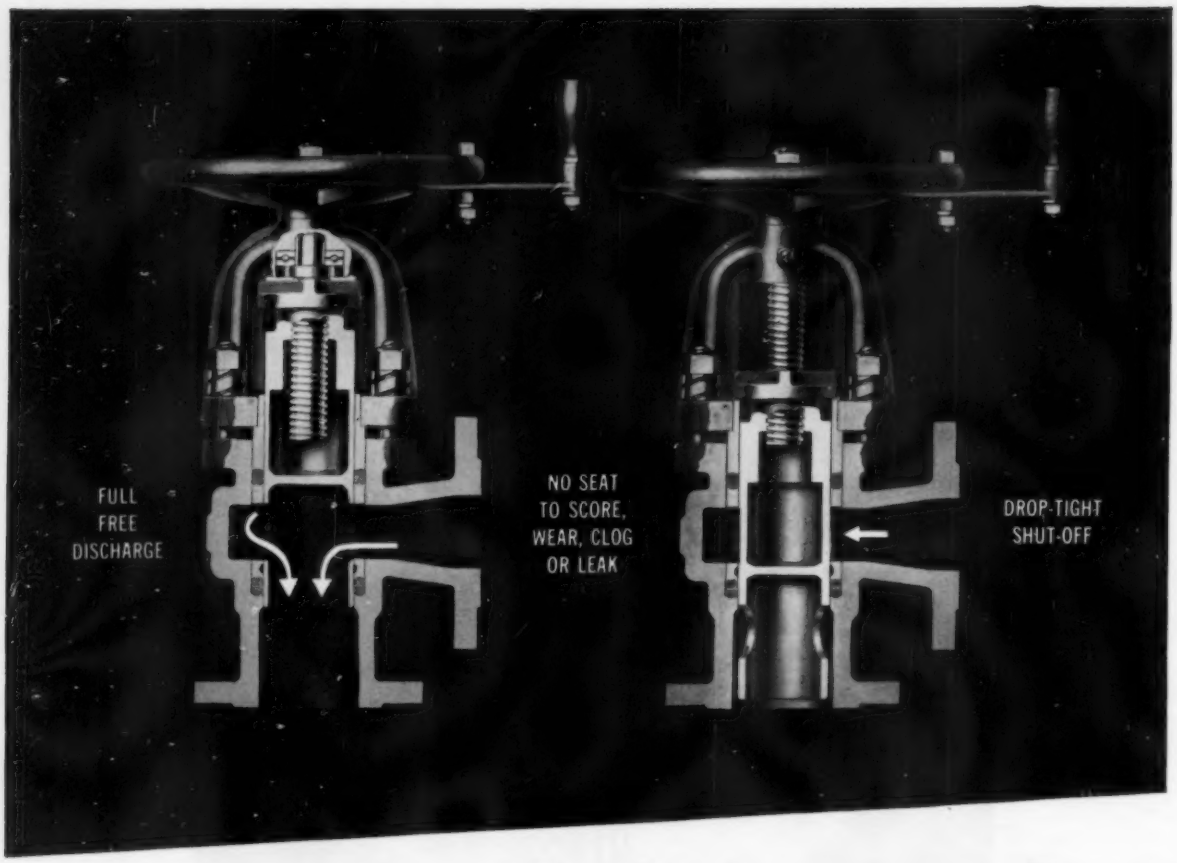

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(Begins on page 23)

144 Small Motors, Relays—Typical specifications on a-c and d-c fhp motors, tachometer generators and ultra sensitive relays are presented in Quick Reference File F-9765. Lists rated horsepower, dimensions, special features and typical applications of motors, relays. Barber-Colman Co.

145 Load Center Transformer—Drawings, dimensions, weights, performances and other data on basic units of load center transformers, along with details on standard transformer arrangements for use with switchgear and other equipment, are presented in 18-pp Bulletin 132-B. Gives data on design and construction, standard and special testing, standard and special accessories. R. E. Uptegraff Mfg. Co.

146 Control Panel Design—Facts to be considered in designing an efficient control panel are discussed in Fact File ER-G-8. Strategic location, electrical and mechanical practices, codes and standards to be kept in mind, enclosures, safety precautions, and some oversights are covered. Fuller Co.

147 Electric Controls—Details on electric controls designed to give stepless torque modulation are presented in 8-pp Form P-75. Describes three types—standard, special and custom—and includes flow chart for easy selection, as well as typical wiring diagram. Warner Electric Brake & Clutch Co.

148 Crane, Hoist Control—Bulletin H-21 describes functions of company's crane and hoist control, a closed circuit, hydraulically operated instrument installed between crane hook and load. Operation details are illustrated and specifications given. Mefco Sales and Service Corp.

149 Switch Cubicle—Bulletin 18X-9442, 14-pp, describes high voltage switch cubicles to house a manually-operated load-break switch incorporating function of a disconnecting switch and circuit interrupter. Discusses operation and maintenance of the load-break switch which is suitable for transformer primary switching in unit substations, for service enterance switching, for throw-over from preferred to emergency circuits, for isolating plant feeders. Allis-Chalmers Mfg. Co.

150 Wire, Cable Terminology—This 52-pp pocket-size glossary of wire and cable terms lists alphabetically common terms, expressions, and units used in the electrical wire and cable industry. A handy wire data chart is given on the back cover. Standard Wire and Cable Co.

151 Building Wire—Applications of Synthinol, a polyvinyl chloride compound in wiring are discussed in Bulletin RCP-3001. Physical properties and electrical characteristics of material are detailed, industrial wiring applications described. Rome Cable Div., Aluminum Co. of America.

152 On Motor-Generator Chargers—Operation and maintenance procedures for automatically controlled vertical motor-generator chargers for lead-acid storage batteries are provided in 8-pp Form 5845. Contains instructions on day-by-day operation and long-range preventive maintenance of equipment, installation data and wiring diagrams. Exide Industrial Div., The Electric Storage Battery Co.

153 Battery Chargers—Selenium or silicon rectifier battery chargers designed for charging station-type batteries are described in this product bulletin. Specifications, data and descriptions of standard models ranging from 15 to 200-amp capacity included. Syntron Co.

154 Electrical Insulations—Twelve-pp Bulletin GET-2929A describes in text, tables and illustrations the characteristics and applications of company's insulating materials for electrical equipment. Provides technical data and suggested uses of such products as mica mat, built-up mica, coated materials, varnishes, paints, adhesives, compounds, thinners, irradiated materials, wire enamels and permafils. General Electric Co.

CORROSION PROTECTION

156 Coating Systems—Described in this 16-pp bulletin are a number of protective maintenance coating systems designed to solve a variety of corrosion problems. Index tab indicates where a particular system should be applied, and copy explains features of each system, suggests uses, mentions colors available. The Glidden Co.

157 Protective Coatings—This 16-pp industrial catalog contains detailed selection and application data on protective coatings for new or rusted metal. A selector guide evaluates technical properties of various coatings, and actual paint chips are provided to facilitate color matching. Master Bronze Powder Co., Inc.

INSTRUMENTS, CONTROLS

158 Industrial Gages—Detailed information on a line of plug and ring gages, standard and special, and on both thread and plain gages, is presented in 26-pp Catalog 59-5. Charts are included giving tap recommendations for classes of threads, and screw thread standards. Regal Div., Beloit Tool Corp.

159 Material-Level Indicator—Eight-pp Bulletin I-5-C describes a line of material-level indicators for controlling level of pulverized, fine, crushed or granular material in bin or silo. Performance data, applications drawings, and schematic of indicator included. Fuller Co.

160 Automatic Data Loggers—Featured in this 12-pp bulletin are automatic data loggers for temperature, pressure, flow, humidity and other conditions. Basic units of the loggers are detailed and operation discussed. Hanson-Gorrill-Brian, Inc.

WATER TREATING

161 How Corrosion Attacks—This water conditioning data sheet explains how and why boiler, cooling and process water systems are constantly plagued by corrosion. Discusses such factors as pH, dissolved solids, temperature, flow rate, dissimilar metals, carbon dioxide. Betz Laboratories, Inc.

162 Ultrapure Feedwater—Technical Reprint T-178 covers research problems relating to production and quality control of ultrapure feedwater for Eddystone Station. Presents pilot plant data on filtration and demineralized process for treating condensate and specific plant-scale design features based on the data are described, as well as analytic methods for measuring quality of condensate. Graver Water Conditioning Co.

On pages 275-276 are two postage-free Reader Service Cards provided for your convenience in ordering these bulletins. You may also use the cards to order any literature mentioned in the ads.

HEATING

163 Industrial Radiant Heaters—Detailed information on two types of industrial radiant heaters for drying, heating, baking and curing is presented in 15-pp Bulletin PE-70. Contains drawings showing assembly of units, charted operational information, installation pointers, and photos of several actual installations. Corning Glass Works.

164 Infrared Unlimited—This comprehensive 20-pp bulletin on the "applications unlimited" of infrared heating covers its principles and advantages in baking, drying, dehydrating, degreasing etc. Presents typical standard systems. Lists specific applications in a range of processing and other industries in which radiant heat can be used profitably. Illustrates many applications. Fostoria Corp.

165 For Outdoor Heating—Brochure CS-306 explains principles of infra-red heating and describes available gas-fired equipment, giving specifications and heating capacities. Illustrates typical examples of outdoor infrared heating, including snow prevention under a building marquee. Perfection Div., Hupp Corp.

VALVES AND FITTINGS

166 Air Operated Valves—Eight-pp Bulletin HB-7 covers pneumatically actuated Saunders valves featuring

MODERNIZE CHOOSE HOISTS THAT SAVE THE MOST

You name the hoisting problem. Whatever the requirements, there's an MMM hoist to handle your lifting with money-saving efficiency. Call your nearby Shaw-Box Distributor for practical help in selecting the best type of hoisting equipment for each load handling task. Or, write us for literature.

AIR HOISTS

Load Lifter Air Hoists with wire rope load line. 1 to 15 tons. The 5-cylinder radial motor has a high starting torque; provides smooth operation at all lifting speeds. Speeds infinitely variable to 37 FPM, depending upon capacity. Pendant cord control standard; throttle control available. Mechanical load brake never needs adjustment. Compact design results in low headroom advantages. Lug, push trolley and hand-geared trolley suspension.

Budgit Air Hoists. ¼, ½ and 1 ton. Compact and light in weight. Link and roller chain types. Explosion proof motor cannot burn out. Spark and corrosion resistant link chain type models. Speeds infinitely variable to 75 FPM, depending upon capacity. Pendant cord control. Safety hooks standard. Rigid mount type and push trolley available.

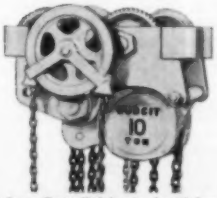
ELECTRIC HOISTS

Load Lifter Series "700" Wire Rope Electric Hoists. ½ to 15 tons. Fast, heavy-duty hoists with two automatic brakes and safe 24-volts at the push-button control. Two-speed models for spotting fragile loads safely. Lug suspension and push, hand-geared and motor-driven trolleys available. Hi-hook model increases length of lift.

Load Lifter Series "600" Wire Rope Electric Hoists. ½ and 1 ton. Low headroom construction. Tough, light-weight hoists that speed production processes. Separate load and motor brakes act simultaneously. Single and two-speed models with 24-volt push-button stations. Lug or hook suspension; push and motor-driven trolleys available.

NEW!
P:B Budgit Electric Hoists. ⅛ to 2 tons. Modern safety-first hoists for money-saving load handling. Push-button control — plus separate motor and load brakes that operate simultaneously—provide fast, accurate "spotting" action. All capacities delivered ready to hang up, plug in and use. AC and DC types. Hook suspension. Trolleys available. Standard models have pull cord control.

HAND HOISTS



Budgit Army Type Hoists. ¼ to 10 tons. Integral push, hand-geared trolleys are adjustable to fit I-beams in a number of sizes. Low headroom design permits high hook lift. Efficient spur gearing and load brake speed hoisting action. Extensive use of strong aluminum alloys saves weight and reduces effort needed to travel the hoist. Spark and corrosion resistant models available.

Budgit Chain Blocks. ¼ to 10 tons. Light, tough aluminum frame seals in spur-geared mechanism and automatic load brake. A 25-lb. pull on the hand chain lifts a 500-lb. load. Fast acting brake speeds and simplifies lowering. Hook suspension. Trolleys available. Ask about spark and corrosion resistant models.

Tugit — the Lever-Operated Hoist. ¾ to 3 tons. A spur-geared, light-weight lifting and pulling tool you can carry around. Has a thousand and one uses. Operates easily at any angle, even in close quarters. A 42-lb. pull on the handle lifts 2 tons. Spark and corrosion resistant models.

Budgit Differential Hoists. ¼, ½ and 1 ton. A durable, low-priced lifting tool for occasional use where high efficiency is not required. The aluminum alloy yokes assure both lightness and strength. Precision machining makes operation easy and compactness saves headroom.

Budgit Roller Chain Block. ¼ to 2 tons. Spur-geared for highest efficiency. A pull of 45 lbs. on the hand chain lifts ½ ton. Light and strong. Mechanism enclosed in sealed housing — operates in grease. Automatic brake holds load safely at any desired point.

ACCESSORIES

Budgit Trolleys. ¼ to 2 tons. Travel the hoist smoothly on ball bearings. Adjustable to fit I-beams of several sizes. Spark and corrosion resistant models.

Budgit Hi-Cap Trolleys. 3 to 20 tons. Adjustable push type. Wheels have crowned treads for easier movement, longer wear. Bumpers protect wheels. No lubrication required. Spark and corrosion resistant models.

Budgit Geared-Type Trolleys. 3 to 20 tons. Adjustable to fit 8" to 24" I-beams. Easy action geared drive wheel and guide are weatherproof aluminum alloy. Hand chain is cadmium plated. Spark and corrosion resistant models.

Budgit Cord Reel. Keeps hoist conductor cord out of the way. Reels off in any direction. Also useful for portable tools with polyphase motors to 7½ hp.; single phase to ½ hp.

Budgit Conductor Cord Trolley. Used in any number to hold hoist or other conductor cord aloft on monorail systems and crane I-beams.

Load Scale. 250 to 5,000 lbs. Permits weighing loads while in suspension. Saves handling time, cuts costs. Also serves to guard against overloading lifting equipment.

Budgit Gantry "A" Frames. 1 and 2 tons. For low-cost mobile lifting service. Caster equipped. Shipped knocked down. Easy to assemble with I-beam purchased locally.

59L-4R

MAXWELL MANNING MM&M & MOORE, INC. TRADE MARK

OVERHEAD LOAD HANDLING EQUIPMENT

Products of

MANNING, MAXWELL & MOORE, INC.

Shaw-Box Crane & Hoist Division • Muskegon, Michigan

In Canada: Manning, Maxwell & Moore of Canada, Ltd., Galt, Ontario

For more facts circle 734 on Reply Card

BULLETINS

(Begins on page 23)

close-coupled design for on-off and throttling control. Gives construction details, operating characteristics and specifications. Includes data on valve sizing and flow coefficients to aid in selection. Conoflow Corp.

167 Check Valves—Details and specifications on a line of check valves designed to eliminate water hammer and line surge are presented in 20-pp Catalog 600. Typical installations are illustrated, and installation data, flow chart, and pressure-temperature ratings included. Combination Pump Valve Co.

168 Flange Connections—Featured in this 16-pp bulletin is a line of flange-type hydraulic tube and pipe connection fittings designed for connecting the larger tube and pipe sizes to hydraulic components. Thirty specific models varying in type of line attachment, angle of flow, male or female form, and including several tee combinations, are diagrammed and dimensioned. L & L Mfg. Co.

169 Expansion Joints—Catalog 850 contains 6-pp of data on a rubber expansion joints and flexible pipe designed to absorb vibration and noise, prevent stresses due to pipe expansion and contraction, and to compensate for minor misalignment. Table of standard dimensions, and pressure and movement limitations are included. General Rubber Corp.

170 Tube Fittings—A wealth of technical data on Hi-Seal butt-joint tube fittings for high pressure and temperature applications is presented in 48-pp Catalog 3108. There are sections on pressure, temperature, vacuum, corrosion resistance, port seals, flow and velocity characteristics along with laboratory reports. The Imperial Brass Mfg. Co.

You'll save time in ordering bulletins by using the Reader Service Cards on page 276. Of course we honor letterhead requests—but it takes us somewhat longer to handle them.

FILTERING

171 Filter Elements—Hydraulic and pneumatic filter elements with components locked together mechanically to provide leak-proof seal are described in this product bulletin. Advantages of pressure-locking which provides freedom from built-in contamination are detailed. Purolator Products, Inc.

172 Filtration for Liquids, Gases—Eight-pp Bulletin GEO-506A describes a line of filtration equipment for liquids and gases. Information is classified according to applications, operating pressures, and sizes. Commerical Filters Corp.

173 Refrigerated Filter—Compressed air dehydration and filtration accomplished by a refrigerated condenser-type filter is explained in Bulletin F-100. Colored flow chart describes function of each section of unit and shows how condensate and contaminants are removed from the air. Hankison Corp.

PLASTICS, SYNTHETICS

174 Plastics Properties—This table shows significant physical, electrical, chemical and optical properties of nine thermoplastic materials—acrylics, acetate, butyrate, Teflon and Kel-F fluorocarbons, nylon, polyethylenes and vinyls. Properties listed include tensile, impact, flexural and compressive strength, resistance to sunlight, water, weak and strong acids and alkalis, dielectric short-time strengths and constants, power factors, hardness, and flexibility. Cadillac Plastic & Chemical Co.

175 Synthetic Chemicals—Physical properties and applications of more than 400 synthetic organic chemicals are covered in this 28-pp booklet. Covers alcohols, acids, anhydrides, chlorine compounds, esters, ethers and oxides, glycol-ethers, glycols and triols, ketones, monomers, polyethylene glycols, metallic salts, and others, including new chemicals for evaluation. Union Carbide Chemicals Co.

176 Plastic Moldings—This 12-pp bulletin discusses company's compression, transfer and injection molding processes and lists the materials and sizes of parts available by each process. Tables of molding material properties are included, as well as illustrations of typical parts and physical and electrical requirements of the applications. Continental-Diamond Fibre Corp.

177 Plastic Electronic Products—This comprehensive electronic products catalog—24-pp Bulletin AD-169—outlines Chemelec Teflon, nylon, Kel-F, Delrin and other plastic electronic components. Covers mechanical and electrical design and environmental characteristics, and contains drawings, illustrations and tables on such items as stand-off and feed-through insulators, hermetically sealed feed-through insulators, connectors, test points, sockets, copper clad Teflon for printed circuits. The Garlock Packing Co.

METALLURGY

178 Ferrous Metallurgy—"Basic Guide to Ferrous Metallurgy" is a four-color chart showing principal characteristics of steels (with carbon content ranging to 0.9 per cent) across the temperature range to 2900 F. Important working zones, including preheating for welding, stress relieving, normalizing, annealing, carburizing and forging are shown. Tempil Corp.

179 Refractory Metals—Eight-pp Bulletin 978 describes tantalum, titanium and zirconium in terms of process characteristics, fields of application, and types of standard and custom equipment available. Specifications on tantalum bayonet heaters included. Pfaudler Permutit Inc.

180 Corrosion Resistance Chart—Over 150 chemicals and their recommended usage with ductile iron, iron steel, 316 and 304 stainless steel, Monel, brass, bronze, copper, aluminum and plastisol plastic are listed in Corrosion Resistance Chart J-CRC. Shows which gasket materials are needed for the various chemicals when Kamlok couplers are used and which O-ring materials are needed etc. OPW-Jordan Corp.

LUBRICATION

181 On Centralized Lubrication—Information on a complete line of centralized systems of lubrication is presented in 24-pp Bulletin 26-T. Advantages and principles of operation are discussed, as well as system components, and illustrations of typical applications included. Farval Div., Easton Mfg. Co.

182 Oilers and Containers—Detailed information on a line of oilers, safety cans, and oil and gasoline containers is presented in 30-pp Condensed Catalog 60-C. Size and capacity data, along with other descriptive details and photos of oilers are included. Eagle Mfg. Co.

FIRE PROTECTION, SAFETY

183 Fire Protection System—Illustrated and described in Form SM-25-160 is a fire protection system which provides automatic detection and notification. Advantages are detailed and detection/notification devices, control equipment, alarm devices, power supply, coding and recording equipment treated. Notifier Corp.

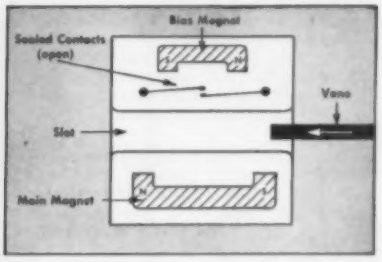
184 Safety Equipment Survey—The cost of routine injuries, lost time accidents and compensable accidents are summarized point by point for eye, respiratory and noise hazards in this safety survey. The total is then related to what is needed for maximum inventory, optimum cost. Wilson Products Div., Ray-O-Vac Co.

185 Color for Safety—This 6-pp booklet shows a cutaway section of a typical industrial plant with all danger areas painted in appropriate safety colors. Lists recommended colors for every safety application, and gives tips on good housekeeping for plants. Valdura Heavy-Duty Paint Div., American-Marietta Co.

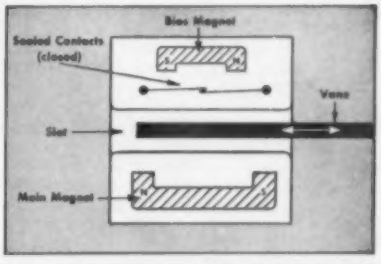
186 Personal Safety Equipment—Catalog 59, 76-pp, covers four general types of personal safety equipment: eye protective wear, including spectacles, goggles and shields and welding equipment; respiratory protection; hearing protection; and headgear. Detailed product descriptions show individual components and parts and charts recommend specific equipment for each hazard. Particular stress is placed upon eye protection, lens properties and materials and frame construction. Willson Products Div., Ray-O-Vac Co.

In Canada: Manning, Maxwell & Moore of Canada, Ltd., Galt, Ontario
For more facts circle 734 on Reply Card

NEW vane-operated limit switch helps industry solve major electrical problem: limit switch life



On normally open form, bias and main magnet flux are balanced at the switch, causing it to remain open. As vane enters the slot, flux of the main magnet is shunted to the lower reluctance path offered by the magnetic material in the vane.



As vane passes the center of the switch, enough flux shunts from the main magnet to cause the flux of the bias magnet to close the switch. Withdrawing vane from the slot reverses the conditions and causes the switch to reopen.

GENERAL ELECTRIC'S ENCAPSULATED DESIGN SEALS OUT CONTAMINANTS; HAS NO ARMS, LEVERS, OR SHAFTS

General Electric's new vane-operated limit switch design surmounts most of the operating problems that cause failure in today's conventional limit switches. The unique new limit switch performs the position-detection function of conventional switches and *eliminates physical contact with the moving object.* It has no shafts or arms to fail, no sliding or rotating parts to wear, no shaft seals to leak.

This means that the operating life of the vane-operated limit switch is not affected by such tough application requirements as frequent operation; hammering of lever arms and mechanisms; lever arm "snapback"; mechanical wear; and splashing and spraying of coolants, lubricants, and other contaminants.

REASONS FOR LONGER LIFE

Contributing to the extremely long life of the new device is the encapsulation of all internal components in a cast aluminum enclosure. This means liquids, dirt, or metal chips cannot enter the switch mechanism and cause operational failure.

In addition, the only moving parts in the new design are magnetic reed contacts hermetically sealed in an inert gas. Thus, switch life is determined almost solely by contact load. When used with small a-c relays, such as the G-E CR2790 general purpose type, the expected operating life of the switch is from 30 to 50 million operations. It is capable of over 250 million operations when operating General Electric static control circuits.

The inherently longer life of the new vane-operated limit switch results in savings from greatly reduced maintenance and replacement expense and less downtime. And the new switch costs about two-thirds less than proximity switches, making it only slightly higher in price than a conventional limit switch.

HOW IT WORKS

The vane-operated limit switch is energized by passage of a separate steel vane through a recessed slot in the switch (see illustrations at right). The vane is attached to the mechanism to be controlled. As the vane passes through the slot, it changes the balance of the magnetic field, causing the contacts to operate. The contacts are hermetically sealed in an inert gas to prolong life.

The new switch is easy to install. Front- or top-operated forms are available to control linear or rotary travel. In addition, the base plate can be rotated 90° to provide mounting flexibility. Both normally open and normally closed forms are available with or without an indicating light. The new limit switch is 25 percent smaller than previous models, and it requires no separate power supply or amplifier.

The switch can detect very high speeds of vane travel without detrimental effects such as arm or mechanism wear or breakage. The switch also offers excellent accuracy and response time. Providing the path of the vane through the slot is constant, trip point repeatability is constant within plus or minus 0.0025 inch. The switch response time is approximately one millisecond.

MEASURABLE ADVANTAGES

Vane-operated limit switches hold significant and measurable operating advantages over conventional limit switches. These advantages can be measured by the maintenance and replacement savings they can produce, and deserve serious consideration on limit switch applications.

For more information contact your G-E sales office or request bulletin GEA-6995 from General Electric Company, Schenectady, N. Y. 811-8

GENERAL ELECTRIC

You get
MEASURABLE ADVANTAGES
with General Electric control.

For more facts circle 680 on Reply Card

BULLETINS

(Begins on page 23)

PROCESSING EQUIPMENT

187 For Chemical Processing—Equipment presented in 12-pp Bulletin S.A1133 includes centrifuges, plate heat exchangers, screens and laboratory devices. Cross-section drawings are included to describe functional differences between six centrifuge types and two processes, production of crude tall oil and refining vegetable oils, are described and illustrated. De Laval Separator Co.

188 For Process Industries—Gages and instruments for the process industries, including pressure and vacuum gages, indicating pneumatic controllers, and pneumatic transmitters, are featured in Bulletin 3015. Includes construction details and technical data. United States Gauge Div., American Machine and Metals, Inc.

189 Dryers, Ovens—Bulletin ID-300 illustrates typical installations for paint baking, heat treating, rubber, plastics and ceramic curing, and similar applications. Also shows typical oven material handling set-ups. J. O. Ross Engineering, Div., Midland-Ross Corp.

190 Centrifugal De-Sludgers—Illustrated and described in this product bulletin are centrifuges for recovering solids from suspensions and slurries. Operation details of the de-sludgers are discussed, and dimensional data and specifications included. The De Laval Separator Co.

191 Gravimetric Feeder—Theory of design and operation of gravimetric feeders is detailed in 8-pp bulletin, Form 157. Advantages of feeding by weight are noted, and photos, drawings, and diagrams showing features included. Stock Equipment Co.

192 Vibrating Feeders—Featured in 12-pp Book 2869 is a line of vibrating feeders designed for feeding a wide range of bulk materials at a uniform rate from bins, hoppers, storage piles or conveyors. Selection and application information is given on all size ranges, and illustrations of both single and twin motor types, others included. Link-Belt Co.

OTHER EQUIPMENT

193 Machinery Mount—Features and advantages of Unisorb precision machinery mount designed for simplified machine installation and vibration reduction are detailed in this 6-pp bulletin. General recommendations and specifications are given. Unisorb Div., The Felters Co.

194 Air Cylinders—Bulletin P2547P contains 24-pp of detailed information on air cylinders, hydraulic cylinders, non-sag piston rods, high-speed cushions, adjustable stroke cylinders, air-hydraulic boosters, air-oil circuits, and Tru-Seal pipe thread fittings for eliminating positioning problems and leakage at threaded connections. Design features and advantages are illustrated, mounting and dimensional data and thrust charts included. Miller Fluid Power Div., Flick-Reedy Corp.

195 Industrial Packings—Fabric, foil, plastic and filament packings designed for service with strong acids, corrosive fluids, solvents, steam, air, ammonia, gases, hot or cold water, chemicals, oils, gasoline, superheated steam, hot gases and oils are featured in 8-pp Catalog FF-1059. Lists details on composition, application, service information, and temperature limits, and includes tables of sizes, weights, lengths. Greene, Tweed & Co.

196 Industrial Steam Cleaners—Bulletin 4008, 8-pp, describes and illustrates Upgrader steam cleaners, providing specifications on four basic models. They have capacities of 100 to 1500 gph of hot cleaning solution. Vapor Heating Corp.

197 Package Boiler—Form 1145 describes forced draft square-heat package boiler-burner units for oil, gas or combination firing. Illustrated with photographs and line drawings, this bulletin contains ratings, dimensions and technical data. Also included are specifications and a list of standard factory-mounted accessories. Industrial Div., American-Standard.

DATA FILE of literature for the plant engineer's library

STANDARD CATALOGS, bulletins and handbooks are listed to help plant engineers maintain a permanent data file. To get these free catalogs, circle item numbers of those wanted on postage-free cards provided on pages 275 and 276.

DUST, FUME CONTROLS

301 Dust and Fume Control—Applications of company's dust and fume control systems in ceramic foundry, grain, metal, steel and wood industries are illuistrated and described in 50-pp Bulletin PE1-2. Design and specification data on centrifugal collectors and units are included. The Kirk & Blum Mfg. Co.

302 Dust, Fume Control—A wide range of industrial dust and fume producing processes that can be successfuly controlled with the properly designed cloth or glass bay-type dust collectors is covered in 24-pp Bulletin 562-D. Operating principles are illustrated. Wheelbrator Corp.

303 Dust and Mist Collectors—Illustrated and described in this fold-out, chart-size Bulletin 736 is company's line of dust and mist collectors and accessory equipment. Detailed specifications are included, as well as application photos. Aget Mfg. Co.

304 Dust Collectors—Self-contained cabinet cloth-filter type dust collectors are illustrated and described in this 6-pp Bulletin 359. Design details and dimensional data included. Torit Mfg. Co.

305 Dust Collector—Bulletin 10-26-59 describes a dust collector with cyclone tubes mounted between the inlet and discharge tube sheets making possible an unobstructed inlet plenum, preventing material buildup and plugging. Dustex Corp.

306 Dust Control Systems—Bulletin 104, 36-pp on company's dust filters, gives detailed information about dust control systems and how to engineer them. Includes description of the Roll-Clean Dynaclone dust filter, as well as information on other dust filters. The W. W. Sly Mfg. Co.

FANS, VENTILATING, AND AIR CONDITIONING

308 Mechanical Draft Fans—Eight-pp Catalog 1361 describes centrifugal fans designed for handling abrasive gases at elevated temperatures. Complete application, performance and physical data are given, as well as a list of accessories. Sturtevant Div., Westinghouse Electric Corp.

309 Power Exhausters—Bulletin 58-B contains 12-pp of detailed information on company's line of power exhausters. Construction features are illustrated and described, and performance and dimensional tables are given. Jenn-Air Products Co., Inc.

310 Heating, Ventilating Equipment—Eight-pp Catalog S317 features heating and ventilating equipment for all types of service, including centrifugal fans, propeller and centrifugal power roof ventilator, propeller fans and unit heaters. Detailed information on performance, construction and dimensions is listed. Ilg Electric Ventilating Co.

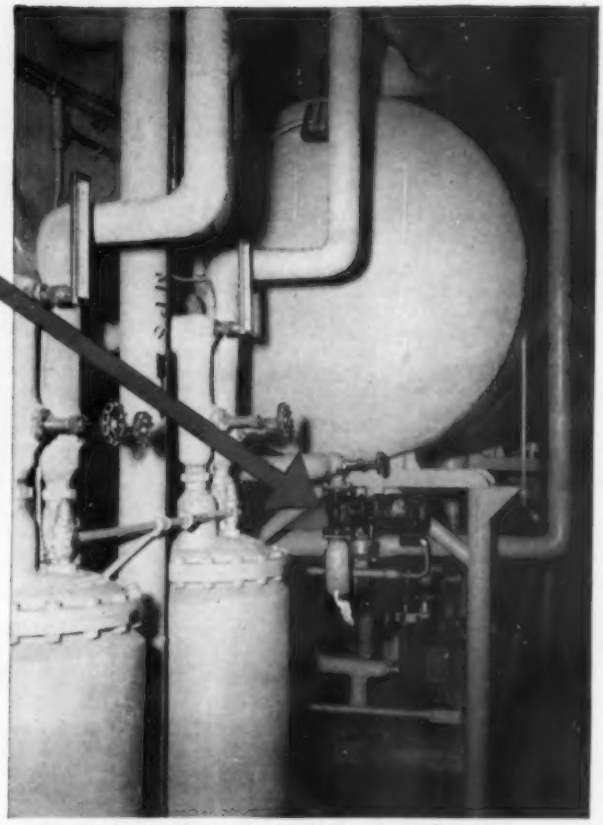
311 Ready Units—Catalog 517 provides 36-pp on complete, ready-to-run centrifugal fan equipment. Capacities 400 to 13,000 cfm, belt and direct driven units. Dimensions included. Clarage Fan Co.

312 Zone Control Cabinets—Air conditioning zone control cabinets are described and illustrated in 20-pp Bulletin AC-220. Separate sections with tables, curves and sketches cover proper unit selection, physical data, dimensions, fan performance and coil ratings for water cooling, direct expansion, hot water and steam. Buffalo Forge Co.

313 Air Conditioning Units—Bulletin 786 contains 54-pp of selection

B&G ALL-BRONZE BOOSTERS

FOR LONG LIFE IN CIRCULATING HOT OR COLD RAW SERVICE WATER FOR FAUCET OR INDUSTRIAL USES

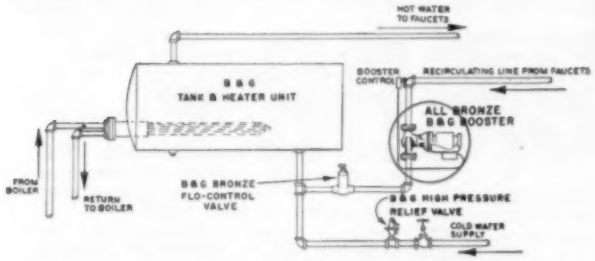


Where hot or cold service water is to be pumped, the use of an all-bronze pump is imperative. Otherwise, the corrosive effects of continuously pumping fresh water materially shortens pump life.

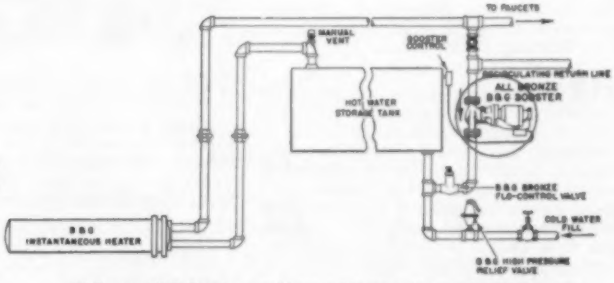
The B&G All-Bronze Booster is specifically built for service water pumping applications. In such systems, the Booster can be installed in numerous ways to step-up efficiency, increase hot water production and reduce heating costs. It is immune to corrosion, hence will give years of dependable service.

For *quiet* operation, failure-proof performance and long life, the B&G Booster is the *preferred* pump.

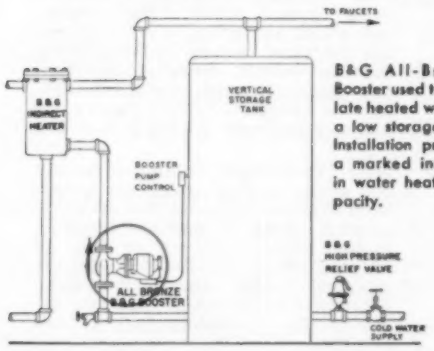
Installation of B&G All-Bronze Booster in Chrysler automatic transmission plant at Kokomo, Indiana. This small unit handles the circulating requirements of the service water heating system.


HOT WATER TO FAUCETS
B & G TANK & HEATER UNIT
BOOSTER CONTROL
RECIRCULATING LINE FROM FAUCETS
ALL BRONZE B&G BOOSTER
FROM BOILER
RETURN TO BOILER
B&G BRONZE FLO-CONTROL VALVE
B & G HIGH PRESSURE RELIEF VALVE
COLD WATER SUPPLY

B&G All-Bronze Booster used on recirculating line from hot water faucets maintains hot water at fixtures at all times. Recommended on all installations, particularly where long plumbing lines are used.



All-Bronze B&G Booster used to provide an extra supply of hot water from an undersized boiler. Semi-tankless hook-up maintains initial supply of hot water.



B&G All-Bronze Booster used to circulate heated water to a low storage tank. Installation provides a marked increase in water heater capacity.

Send for Bulletin No. IA-856

BELL & GOSSETT COMPANY

Dept. GD-53, Morton Grove, Illinois

Canadian Licensee: S. A. Armstrong Ltd., 1400 O'Connor Drive, Toronto 16, Ontario

For more facts circle 681 on Reply Card

DATA FILE

(Begins on page 282)

data on air conditioners, including capacities, standard arrangements, dimensions. etc. Steps in selection of basic unit and components are outlined. First pages are devoted to choosing the physical size based on air capacity and face velocity requirements, while succeeding pages concern themselves with heating and cooling requirements, control. American Air Filter Co., Inc.

314 **For Air Conditioning**—Featured in 8-pp Bulletin S-290 is company's line of products for air conditioning, as well as products for heating, ventilating and heat transfer. Installations shown. The Trane Co.

VALVES, TRAPS, PIPING

315 **Stainless Steel Valves**—Corrosion resistant stainless steel valves are featured in 32-pp Catalog 59SS. Features of design and construction are shown through cutaway views, and advantages of stainless steel in withstanding corrosive attack of chemicals and atmospheres are detailed. Jenkins Bros.

316 **Industrial Valves**—Bulletin 507X illustrates and describes company's line of industrial valves for control of air, gas, liquids and solids. Features photos and descriptive detail on a variety of butterfly valves, water valves, slide valves. W. S. Rockwell Co.

317 **Butterfly Valves**—Iron body, rubber seated butterfly valves and operators are featured in 36-pp Bulletin 5904. Contains complete information on the valves, designed for hydrostatic operating pressures up to 125 psi and velocities up to 16 ft. per sec., including data on construction and design, dimensions, general hydraulic data, materials and operation. Darling Valve & Mfg. Co.

318 **Butterfly Valves**—Bulletin 10 contains detailed selection information on a rubber seat butterfly valve designed to mount between pipe flanges. Contains tables of maximum valve line pressures for various cylinder operating pressures, water flow characteristics of butterfly valves, gas flow characteristics, material selection chart. Henry Pratt Co.

319 **Teflon Disc Valves**—Eight-pp Bulletin 11 describes a line of valves with Teflon renewable disc or seat. Advantages of Teflon-seated valves are detailed and dimensional data included. Alloy Steel Products Co.

320 **Valve Buyers' Guide**—Detailed information on bronze, steel and iron valves, and valves made of corrosion-resistant metals and alloys is presented in 24-pp Form 186. Covers angle valves, check valves, gate valves, globe valves, liquid level valves, lubricated plug valves, needle valves, relief valves, sampling valves, steam jacketed valves and others. The Wm. Powell Co.

321 **Steam Trap**—Bulletin 257 describes features and operation of a steam trap which uses the kinetic energy of steam to close the valve. Operation details are illustrated and capacities tabulated. Sarco Co., Inc.

322 **On Steam Traps**—Catalog K is an enlarged 48-pp manual and steam trap catalog. New material provided includes open float and thermostatic traps, pipe strainer to 6 in. steel and semi-steel, and in helpful steam pipe sizing tables. Discusses fundamentals of good trapping, trap selection, installation, testing, repairs. Armstrong Machine Works.

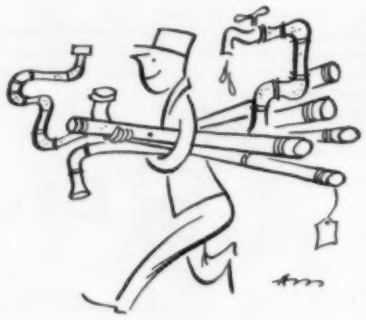
323 **Impulse Steam Traps**—Operation details and advantages of company's impulse steam traps are described in 8-pp Bulletin T-1742. Data on pressures and temperatures, materials, capacities, dimensions and typical applications included. Yarnall-Waring Co.

324 **Glass Pipe and Fittings**—Corrosion-resistant qualities of this Pyrex brand glass pipe and fittings which make it suitable for use under corrosive conditions are described in 44-pp Bulletin PE-3. Operating temperatures, physical characteristics, installation procedures are covered and specifications and dimensional drawings given. Corning Glass Works.

325 **Lined Clay Pipe**—Described in this illustrated brochure is a glass lined sewer pipe with built-in advantages. Performances and installation details are illustrated. American Vitrified Products Co.

327 **Process Piping**—Chemical-resistant plastic pipe, fittings and valves are featured in 16-pp Bulletin CE-80. Advantages are detailed, and installation procedures outlined. Technical data tables are also included. American Hard Rubber Co.

328 **Reinforced Plastic Pipe**—Detailed information on characteristics and applications of reinforced plastic pipe is presented in the 16-pp Bondstrand Bulletin. Temperature and pressure curves are included, along with dimensions. Amercoat Corp.



329 **UPVC Pipe, Fittings**—Technical data and installation information on unplasticized polyvinyl chloride pipe are provided in 24-pp Booklet TTP-119. Also gives specifications for threaded and socket types of UPVC fittings, valves and flanges, or normal and high-impact material. Tube Turns Plastics, Inc.

330 **Valved Couplings**—Features and applications of company's valved couplings designed for instant shut-off are detailed in Bulletin H-1686. Covers couplings for high pressure, vacuum and very low pressure, for impact air lines and for hard to handle fluids. Snap-tite.

HOSE AND FITTINGS

331 **Flexible Metal Hose**—Featured in 8-pp Catalog 188 is a line of flexible metal hose, as well as rubber and synthetic hose. Detailed specifications and dimensional data are included. Flexonics Corp.

332 **Tube Fittings and Hose**—Comprehensive data on brass and steel tube fittings, tube working tools, hose, hose ends and assemblies most frequently used in hydraulic and pneumatic systems is presented in 16-pp Catalog C-301. Selection data included. The Weatherhead Co.

333 **Industrial Hose**—Bulletin IH-10 features application and selection data on industrial hose, including braided, wrapped and braided, wire woven, smooth bore and rough bore. Descriptions of each type of hose are given. The Gates Rubber Co.

PUMPS AND COMPRESSORS

334 **Centrifugal Pumps**—Advantages of cradle-mounted centrifugal pumps are detailed in 20-pp Form 7223-B. A cutaway view illustrates performance features and tables list dimensions and specifications. Cameron Pump Div., Ingersoll-Rand Co.

335 **Vertical Turbine Pumps**—Featured in this product bulletin is a line of vertical turbine pumps job-engineered to suit specific applications in industry. Design and construction details are noted. Fiese & Firstenberger Mfg., Inc.

336 **Vertical Process Pumps**—Heavy duty vertical process pumps for handling corrosive liquid in the chemical and allied industries are illustrated and described in 8-pp Bulletin 727-1. Sectional views, table of construction materials-parts interchangeability, performance curves, dimensions and specifications. Goulds Pumps Inc.

337 **Centrifugal Pumps** — Features and advantages of centrifugal pumps with vertical split-case design which permits servicing without breaking piping connections are detailed in 12-pp Bulletin HY-558-A. Complete selection tables, dimensional data, construction materials chart and capacity chart included. Bell & Gossett Co.

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AMERICAN CANCER SOCIETY

DATA FILE

(Begins on page 282)

338 Single Suction Pumps—Ball bearing single suction pumps are illustrated and described in 24-pp Bulletin 976-H. General data and specifications are included, as well as rating tables, outline dimensions, sectional reference drawings. Buffalo Pumps, Div. Buffalo Forge Co.

339 Alloy Metal Pumps—Recent additions to company's line of alloy metal pumps for hot or cold corrosive and slurry services are illustrated and described in a series of product bulletins. Bulletins 5005 through 5030. Includes performance curves, cross sectional diagrams, dimensional data and detailed specifications on all pumps. Dorr-Oliver Inc.

340 Liquid Pumps—Heavy-duty liquid pumps for pumping paints and inks as well as other abrasive liquids are described in Data Sheet SP-507. Features are illustrated and dimensional data and specifications included. Viking Pump Co.

341 Industrial Compressors—Oil-free heavy-duty industrial compressors are illustrated and described in 12-pp Bulletin A-92. Cutaway views show details of internal design and construction, and bulletin includes photos of typical installations, specifications and other data. Joy Mfg. Co.

342 Water-Cooled Compressors—Featured in 12-pp Bulletin WB10 are two-stage water-cooled air compressors designed to meet the demand for small machines having efficiencies comparable to those of large two-stage horizontal compressors. Cutaway views showing component features are included, as well as general data. Gardner-Denver Co.

343 Compressors, Gas Turbines—Featured in 38-pp Bulletin 151 is a line of compressors and gas turbines for the petroleum, gas, production, pipeline, refining, chemical petrochemical industries. A number of different models in the line are covered, with descriptions of features and operation, and dimensional data and diagrams. Clark Bros. Co.

PACKINGS, SEALS

344 Metal Packing—Featured in 24-pp Form AD-166 is detailed information on selection of metal packings for use wherever gas or air is compressed or expanded. Covers free-floating metal packings, metal rod packing rings, metal scraper rings. The Garlock Packing Co.

345 Mechanical Packings—Featured in 24-pp Catalog 56 are several recent packing developments including the multi-purpose Bel-Vee V-Ring packings, the long wearing criss-cross braid packing series, twisted foil packings for oil and distillate temperatures to 1000 F, and an Inconel-wire reinforced plastic packing for valves handling superheated steam at temperatures up to 800 C. Packings for every industrial application are covered. The Belmont Packing & Rubber Co.

346 Self-Lubricating Packings—Featured in this 30-pp Bulletin PC-103 is detailed information on company's line of packings with internal lubrication. Application chart, table of physical properties, and ordering instructions. Greene, Tweed & Co.

347 External Mechanical Seal—Bulletin CP-551 features a mechanical seal designed for complete interchangeability with packing in stuffing boxes of pumps and other rotating processing equipment. Cutaway drawings and an installation diagram are provided. Chemical and Power Products, Inc.

MECHANICAL POWER TRANSMISSION

348 Packaged Speed Control—Bulletin 20,000, 8-pp, describes a line of packaged speed control drives which incorporate power conversion equipment for converting a-c to d-c power. Advantages are detailed and component features described. The Clark Controller Co.

349 Power Transmission Equipment—Featured in 48-pp Book 2747 is a line of gearmotors, Motogears and fluid drives for power transmission applications. Advantages of design and operation are detailed, and comprehensive selection tables are included, as well as photos, cutaway views and diagrams showing component features. Link-Belt Co.

350 Power Transmission Products—Catalog 759 contains 104-pp of engineering data, specifications and prices on roller chain, sprockets, couplings and conveyor chain. Data includes material on selection of roller chain drives, speed ratios for sprocket combinations, chain length tables, illustrations of various standard attachments, and technical specifications. Diamond Chain Co., Inc.

351 Transmission Belting—Application information on company's line of transmission belting is presented in 16-pp Bulletin S-5174. Specific types of belting for a variety of applications is illustrated and described, and technical data tables, and a selection table for drives included. The Goodyear Tire & Rubber Co.

352 Grommet V-Belts—Advantages of company's grommet V-belts are illustrated and described in this 8-pp bulletin. Belt features are fully described, and a section on how to figure a V-belt drive is included. Goodall Rubber Co.

353 V-Belts and Fasteners—Bulletin V-227 contains 6-pp of detailed information on V-belts and V-belt fasteners. Describes use of fasteners with open-end V-belting, how to determine belt lengths, and includes V-belt replacement charts, and other data. Flexible Steel Lacing Co.

354 FHP Sheaves—Bulletin A687 describes features and advantages of company's line of fractional horsepower sheaves and sealed-line V-belts. Selection tables and dimensional data are included. Dodge Mfg. Corp.

355 Side Bar Roller Chain—Offset side bar roller chain for use in industries where extremely difficult operating conditions are encountered is described in this product bulletin. Advantages are detailed and dimensional data given. Atlas Chain & Mfg. Co.

356 Flexible Couplings—Comprehensive selection data on flexible couplings is presented in 48-pp Engineering Catalog 60. Misalignment is described and basic coupling arrangements and load classifications are included, along with photos of couplings and installations, diagrams etc. Thomas Flexible Coupling Co.

357 Magnetic Pulleys—Features and advantages of company's magnetic pulleys for removing tramp iron and small iron contamination, preventing machinery damage, fire and explosions are detailed in this product bulletin. A general guide to pulley selection covers types of tramp iron, principle of pulley operation, capacities, dimensions. Eriez Mfg. Co.

358 Anti-Friction Bearings—Catalog 424-B entitled "The broadest line in the anti-friction field," is an 8-pp folder giving capsule presentation of company's entire product line. A brief description of each product is provided. SKF Industries, Inc.

LUBRICANTS, LUBRICATION

359 Organized Lubrication—Benefits of organized lubrication—major cost control factor—are told in this 24-pp bulletin. Cost control opportunities are detailed and the task of assigning responsibilities and delegating authority in an organized lubrication system covered. Texaco, Inc.

360 Centralized Lubrication—The application of centralized lubrication to industrial machines or vehicles is detailed in 12-pp Catalog 34-28A. Analysis of machine bearings is among subjects discussed as are selection of lubrication interval, selection of system components, selection of appropriate lubricant, installation procedure. Alemite Div., Stewart-Warner Corp.

361 Lubricant Data—Characteristics, advantages of company's line of specialized fluid and grease type lubricants are described in 32-pp Data Book 59-2. Includes sections on control of friction, use of grease type lubricants, proper applications, and recommendations for various operating conditions. Lubriplate Div., Fiske Brothers Refining Co.

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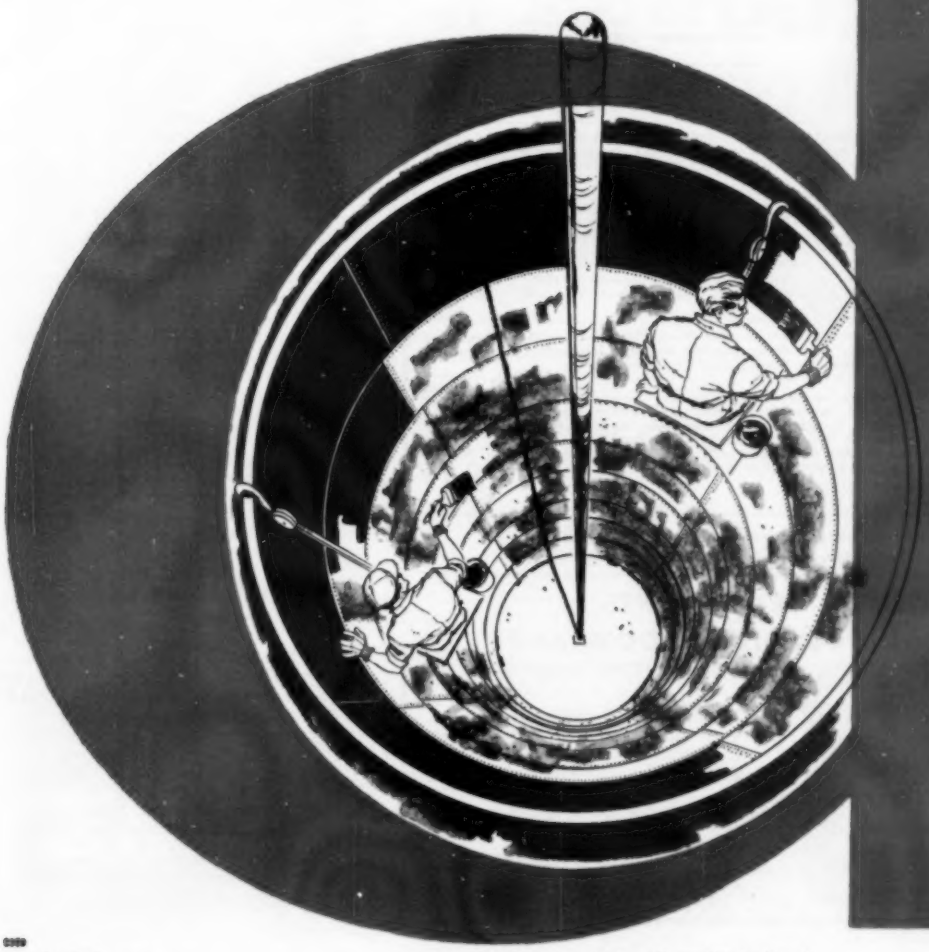

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6	Construction Specifications—20-page reprint of five-part article on construction specs. Discusses what should be included in specs; payments, arbitration; construction bids; signing contract; progress report and final inspection. A copy of "General Conditions" will accompany the reprint.	2.00
7	Your New Industrial Power Plant—How to Get It Into Operation—24-page reprint of series of articles by Paul N. Garay from 1957 issues on building your new plant right and how to set up operating records.	1.00
8	What It Costs to Modernize Small Industrial Power Plants—24-page reprint of series of articles by H. D. Fisher from 1957 issues, giving six case studies of plants from 25,000 to 50,000 lb of steam per hour capacity.	1.00
9	Cherry-Hill—16-page reprint of article describing what construction preplanning is necessary. Article discusses use of consultants, methods of bidding, basic concepts, selling the project to management.	0.50
10	A Power Plant Primer—32-page reprint of article by A. W. Kramer explaining the fundamental principles of the steam-electric power plant and of each unit of principal equipment, showing how they all operate.	1.00
11	Pumps—4-page reprint of article "Pumps—and Why They Have Troubles." Some of the points covered in article: sagging foundation, distortion of base plate, proper packing and its importance	0.10
12	Construction Briefs—12-page booklets. Booklet No. 1—covers beam reactions, bending moment, moment of inertia and section modulus. Booklet No. 2—deflection, horizontal shear and floor loading. Booklet No. 3—columns, trusses and welded connection. Booklet No. 4—fastenings for timber, design of trussed roof and structural design. Booklet No. 5—Designing in Reinforced Concrete.	0.50 for each Booklet 1 to 4 0.75 Booklet 5

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DATA FILE

(Begins on page 282)

362 Lubrication Oil—Advantages of company's solvent refined, rust and oxidation inhibited oil tuned to keep maintenance costs lower in such applications as circulating systems, hydraulic systems, paper machine dryer roll bearings, marine turbines and gears, pumps, compressors, fans, gear units, blowers, motors and generators are detailed in this Product Pamphlet SP-8827. Gulf Oil Corp.

MAINTENANCE

363 Protective Coatings—This 38-pp comprehensive treatise (Form 259) on rust and corrosion control by protective coatings contains a gatefold spread showing actual color standards of company's primers and top coatings. Covering water resistant, heat resistant, floor coatings, heavy-duty chemical resistant coatings, galvanized metal coatings, wire fence roller coatings, and quick-dry coatings, booklet contains full-color application photos and 110 color chips, technical section. Rust-Oleum Corp.

364 Metal Surface Treatment—This 40-pp catalog on metal surface processing (cleaning, washing, rinsing, drying, and spraying flow and dip coating) illustrates and describes drum-type machines, conveyor machines and systems, combination drum and conveyor machines, monorail machines, complete automatic finishing systems, and barrel finishing equipment. Design features, components and accessories are covered. Ransohoff Co.

365 Metal Treatment—Featured in this product bulletin is a metal treatment designed to be applied directly on rusted metal to stop rust action and provide a sound base for maintenance paint. Advantages described. Rusticide Products Co.

366 Coatings for Industry—Detailed information on a variety of coatings for industrial application, including anti-corrosive coatings, decorative finishes, exterior wall and roof coatings, floor materials, fungus and mold treatments, industrial coatings, interior wall coatings, roof coatings and other products, is presented in 40-pp Catalog 59. Properties and application details covered. Steelcote Mfg. Co.

367 Protective Coatings—Latest developments in corrosion resistant coatings, treatments for floors, and coatings and waterproofing for masonry are described in 72-pp Form 990. Presents detailed information on maintenance products for interiors, floor coatings, exteriors, new construction, etc. Truscon Laboratories, Div. Devoe & Raynolds Co., Inc.

368 Corrosion-Resistant Coatings—Bulletin 100 contains a table listing protective coatings for corrosive

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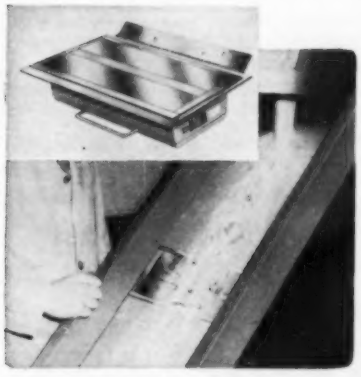

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classifications. Description and general use of various types of coatings, performance and application information, and chemical resistance ratings are given. Carboline Co.

369 Masonry Treatments—Waterproofing, protective and corrective treatments for masonary are described in 20-pp Circular 17. A variety of applications are illustrated, and suggested specifications are given. Standard Dry Wall Products, Inc.

370 Insulation Coating—This 32-pp illustrated handbook, Form L-17, presents the advantages of company's No-Drip insulation coating for preventing condensation drip from metal, concrete, brick, wood, plaster, or composition surfaces. Lists applications. Mortell Co.

371 Basic-Roofing Information—"What You Should Know About Your Roof" is a 40-pp clearly illustrated booklet which tells what makes a roof fail, how to recognize signs of roof deterioration, what to do to keep a roof in good condition. Discusses roofing practices. Johns-Manville.

372 Floor Maintenance—Many types of industrial floors are studied and their soil removal problem analyzed in this 8-pp booklet, complete with charts, list of cleaning compounds, and descriptions of cleaning methods. Methods of sanitizing, stripping wax and paint, and of absorbing liquids told. Oakite Products, Inc.

373 Industrial Cleaning Products—This file of literature covers manufacturer's full line of blower-suction cleaners, hot or cold air blowers, blowtorches, furnace blowers, industrial vacuum cleaners and optional equipment. Provides photos of models available and typical applications, along with product specifications. Clements Mfg. Co.

374 Industrial Vacuum Cleaning—Twelve-pp Bulletin 155 B describes both stationary vacuum cleaning equipment and portable industrial vacuum cleaners, the latter in both light and heavy-duty types. Recent improvements in collection and dumping methods are also covered. Spencer Turbine Co.

SAFETY, SANITATION

375 Fire-Resistant Fluids—This series of specification sheets describes company's line of fire-resistand fluids including synthetic, oil-water emulsion and glycol types. Physical characteristics and other data given. Mobil Oil Co., Inc.

376 Special Fire Protection—Devoted to special hazard fire protection, this 44-pp booklet covers both equipment and methods. Tells how to recognize special fire-hazards conditions in a plant. Discusses in detail major types of fire protection, telling how each functions, giving it advantages and limitations, and illustrating some examples of successful use. Grinnell Co., Inc.

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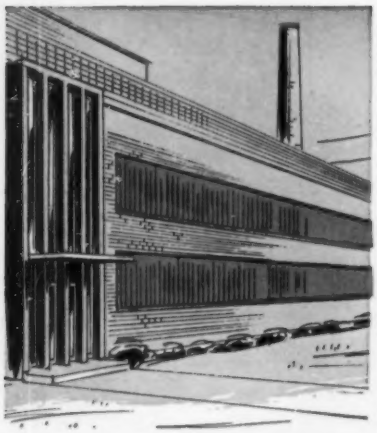

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DATA FILE

(Begins on page 282)

377 Sanitary Maintenance—This 16-pp booklet tells how to control costs, improve efficiency and save management time in sanitary maintenance. Tells what an engineered maintenance program includes, how it is prepared, advantages afforded. Puritan Chemical Co.

378 Functional Color Kit—Selection of paint colors to promote efficiency, safety and morale in industrial plants is among the subjects covered in this Functional Color Kit. Color specifications for mechanical areas, drafting rooms, wash rooms, cafeterias, etc., are illustrated and explained, and a set of 36 color chips of recommended paint colors, identified by number and showing reflectance percentage of each, are included. Colorizer Associates.

379 Industrial Soaps—Featured in this product bulletin are three skin cleaners designed for use in industrial plants. A fine granulated cleanser, a heavy duty type, and an extra fine granulated cleanser are covered. Sugar Beet Products Co.

380 Soaps, Soap Equipment—Characteristics and advantages of company's liquid soaps are described in this 15-pp bulletin. Dispensing equipment for these soaps is also illustrated and described. West Chemical Products Inc.

WATER TREATING

381 Corrosion Control—Process Bulletin B6 discusses causes of condensate system corrosion and methods of corrosion control in steam condensate systems. Condensate corrosion inhibitors are illustrated and described. Nalco Chemical Co.

382 Coagulant Aids—Featured in this product bulletin is a line of coagulant aids designed to improve floc formation in clarifying and softening water. Advantages are detailed. Calgon Co., Div., Hagan Chemicals & Controls, Inc.

383 Consulting Service—Advantages of company's consulting service are detailed in 8-pp Bulletin 5006-A. How the service is qualified to solve problems concerning scale and corrosion control in boilers, cooling systems, and process waters is discussed. Dearborn Chemical Co.

BOILERS AND GENERATORS

385 Hot Water Boilers—Catalog HCC-2, 20-pp describes and illustrates design, construction, advantages and economies of company's controlled circulation hot water boiler for supplying high pressure, high temperature water for heating systems and process applications. Combustion Engineering, Inc.

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386 **Bent Tube Boilers**—Design and operation features of company's bent tube boilers for power, processing or heating are detailed in 22-pp Bulletin VF-VS-2. Boiler sections of typical installations and principal data on each are included. Henry Vogt Machine Co., Inc.

387 **Scotch Marine Boilers**—Featured in Bulletin B-3333 is a line of Scotch Marine Boilers designed to meet exacting mechanical and thermal specifications. Mechanical and thermal features are detailed and specifications tabulated. The Titusville Iron Works Co.

HEATERS, HEATING

388 **Unit Heaters**—Performance and application information on company's line of unit heaters for steam and hot water heating systems is presented in 16-pp Catalog 159. Steam and hot water performance data tables are included, as well as dimensional data, mounting suggestions, points on selecting and locating unit heaters. Modine Mfg. Co.

389 **Direct Fired Heaters**—Complete description and specifications on unit heaters, duct furnaces and heavy duty heaters are presented in 12-pp Bulletin A1-1.2b. Cutaway views and construction features are included. Reznor Mfg. Co.

390 **Heating, Cooling Coil**—Technical Data Sheets 8 through 60 Series give complete engineering specifications on complete line Dean Panelcoil for heating and cooling processing and storage equipment. Use with Bulletin 259 showing complete price information. Dean Products, Inc.

391 **Industrial Heaters**—Advantages and features of a line of industrial heaters for space heating, drying, make-up air and oven applications are detailed in this illustrated bulletin. A cutaway view points out features. Lennox Industries, Inc.

392 **For Heating Systems**—A great deal of helpful information on heating systems is presented in Engineering Data Manual 2695, 28-pp Detailed illustrated information pertaining to heating problems is given. Besides covering heating terminology there are sections on steam data, water properties, piping data, weights and measures. Dunham-Bush, Inc.

TOOLS, WELDING, AND MACHINE SHOP EQUIPMENT

393 **Pipe Tools**—Ordering and application information on Rigid pipe tools is provided in 16-pp illustrated Catalog 7596R-6. Wrenches, cutters, threaders, reamers, vises, and others are pictured and described, also power drives. The Ridge Tool Co.

394 **Portable Electric Tools**—Form 10 features a complete line of portable electric tools including drills,

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DATA FILE

(Begins on page 282)

screw-drivers, impact wrenches, magnetic drill presses, sanders, grinders, hammers, holesaws, and forged tools. The Black & Decker Mfg. Co.

395 **Industrial Wrenches Hand Tools**—Tools for production lines, maintenance work and product servicing are presented in 156-pp Industrial Catalog 58-I. Loaded with pictures and tool facts, book describes in detail the complete line of over 4,000 tools—including chests and roll-cabs, wrenches and sockets of all types, screwdrivers, pliers, pullers, etc. Snap-on Tools Corp.

396 **Air Tools**—The growing use of air tools for a variety of applications in building and industry is covered in 8-pp Bulletin AT-116B. Selection data for air tools and a trouble chart are included. Le Roi Div., Westinghouse Air Brake Co.

On pages 275-276 are two postage-free Reader Service Cards provided for your convenience in ordering these catalogs. You may also use the cards to order literature mentioned in ads.

397 **Powder Actuated System**—Two booklets cover applications of a powder actuated fastening system. One booklet shows how it can be used for plant maintenance—fastening conduits, bus ducts, junction and outlet boxes, surface raceways, fixtures and frames, etc. The second booklet indicates the correct fastening and charge to use. Ramset Div., Olin Mathieson Chemical Corp.

398 **Power Tool Guide**—Thirty-pp Catalog 105 describes 70 portable electric tools and kits with over 400 accessories. Buying guide includes pictures of tools and their applications with complete specifications and prices for electric saws, sanders, drills, planes, routers, shapers, and combination tools. Porter-Cable Machine Co.

399 **Power Tools**—Comprehensive information on power tools for industrial production, plant maintenance, construction, wood and metalworking is presented in the 58-pp edition of their 1959 product guide. Specification and applications data on such items as power saws and saw blades, sanders, grinders, brushes, drills, files, grinding wheels, screwdrivers included. Skil Corp.

400 **Welding Flux Recovery**—This bulletin tells how company's equipment salvages unused flux from submerged arc welding, removes powder and returns slag-free, dust-free flux to welder in a continuous flow. Dimensions and specifications are given for extensive line of both stationary

and portable models. Invincible Vacuum Cleaner Mfg.

401 **Welding Equipment**—Twelve-pp Bulletin W-158 features a line of transformer, rectifier and rotary d-c welders for a variety of industrial requirements. Detailed specifications and dimensional data are included. Harnischfeger Corp.

402 **Machine Mounts**—A vinyl cork, sisal machine pad and an adjustable machine mount for reduction transmitted vibration and no bolting of machine are described in literature available from the company. Clark-Cutler-McDermott Co.

403 **Data for the Shop**—"Fluids and Facts for Metal Working" is a pocket-size booklet of about 44-pp. A section on metal working fluids covers their function and selection, preparation and use of soluble oil and paste compounds, and prevention of dermatitis. Conversion tables, steel numbering systems, machinability ratings. Standard Oil Co. (Ind.)

CONSTRUCTION

404 **Foundation Pipe Piles**—Comprehensive information on Taylor Forge spiral-weld foundation pipe piles is presented in 24-pp Form F-5677. In addition to detailed specifications, the illustrated booklet describes a number of pipe-pile installations. L. B. Foster Co.

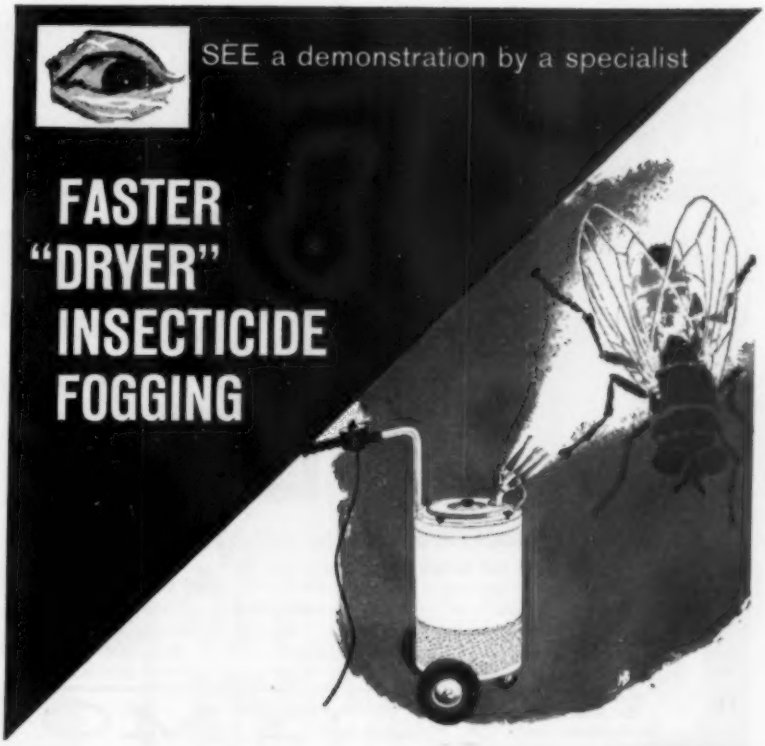
405 **Structural Clay Products**—Descriptive information, photos and construction details on structural clay building materials are presented in 24-pp Catalog S-60. Characteristics and advantages of various types of facing tile, bricks, and other products are detailed, and color-photos of typical installations included. Natco Corp.

406 **Steel Buildings**—Advantages of building with steel are illustrated and described in colorful 12-pp Catalog B-16359. Various types of building constructions are illustrated, and details of construction shown, along with dimensional data. Armco Drainage & Metal Products, Inc.

407 **Insulating Panel**—Application information and design data for Asbestone insulating panels are presented in 28-pp Manual, File 19-D. Covers construction and characteristics of panels, exterior curtain wall applications, interior applications, painting and decorating panels, and specifications. National Gypsum Co.

408 **Fir Plywood**—This 34-pp construction guide contains full-page structural drawings providing basic information on types, grades, and applications of fir plywood. Booklet covers information on floor construction. Douglas Fir Plywood Assn.

409 **Replacement Glazing**—Twelve-pp Booklet PL-251 gives detailed information on glazing industrial and other buildings with flat panels of the acrylic plastic, Plexiglas. Written



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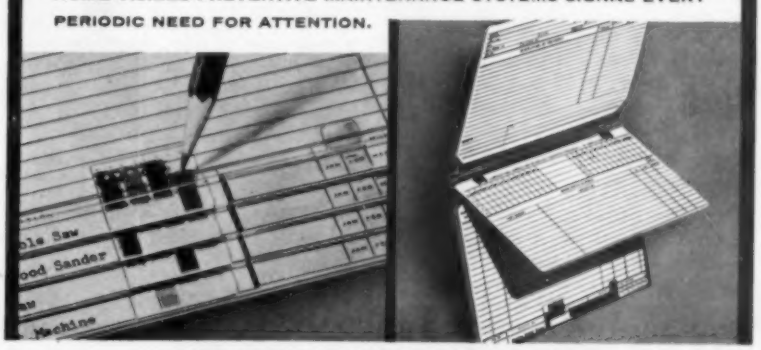

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DATA FILE

(Begins on page 282)

for plant engineers concerned with frequent breakage of windows or other glazing problems, this practical booklet gives properties of this sheet. Plastic Dept., Rohm & Haas Co.

410 **Functional Glass**—Advantages of company's rolled, figured and wired glass for vertical sidewall and skylight glazing are detailed in Catalog 59-G, 20-pp. Describes types suited for commercial, institutional, industrial applications. Provides properties. Mississippi Glass Co.

411 **Aluminum in Colors**—This bulletin introduces Alcoa's Alumalure colored aluminum architectural building sheet prodcts, a complete line of sheet products offered in 11 colors. Aluminum Co. of America.

412 **Aluminum Sash**—Illustrated and described in this product sheet is rigid welded sash made from aluminum extrusions. Advantages are listed and sectional details pictured. Aluma-Sash Corp.

413 **Industrial Doors**—Features and advantages of company's automatic industrial doors illustrated and described in 8-pp Catalog 159. Dimensional drawings and photos showing details of design and operation given. Clark Door Co., Inc.

414 **Resilient Floors**—Properties and characteristics of resilient flooring are covered in comprehensive 52-pp Catalog File 23-G. Offers a guide to basic types of vinyl flooring materials, characteristics, gauges of resilient flooring, and other technical data, and includes methods and techniques of installation and detailed specifications. Armstrong Cork Co.

415 **Steel Floor Plate**—Features and advantages of rolled steel floor plate are detailed in this Product Form 3184. Table of dimensional data is included, as well as illustrations of installations. Alan Wood Steel Co.

416 **Grating, Stair Treads**—Bulletin 1105, 16-pp, describes construction and design advantages of company's line of interlocked grating and stair treads. Contains detailed information, photos, drawings and engineering data on rectangular, diagonal, radial and serrated gratings, stair treads, armoring. Dravo Corp.

417 **Safety Grating**—Steel, aluminum and stainless steel safety grating for a variety of industrial applications is featured in illustrated 24-pp Catalog 5911. Shows typical installations, and includes complete engineering data for erection, as well as detailed load charts. The Globe Co.

418 **Grating and Treads**—Safety, visibility, permanence and easy maintenance are among advantages of open flooring discussed in 28-pp Bul-

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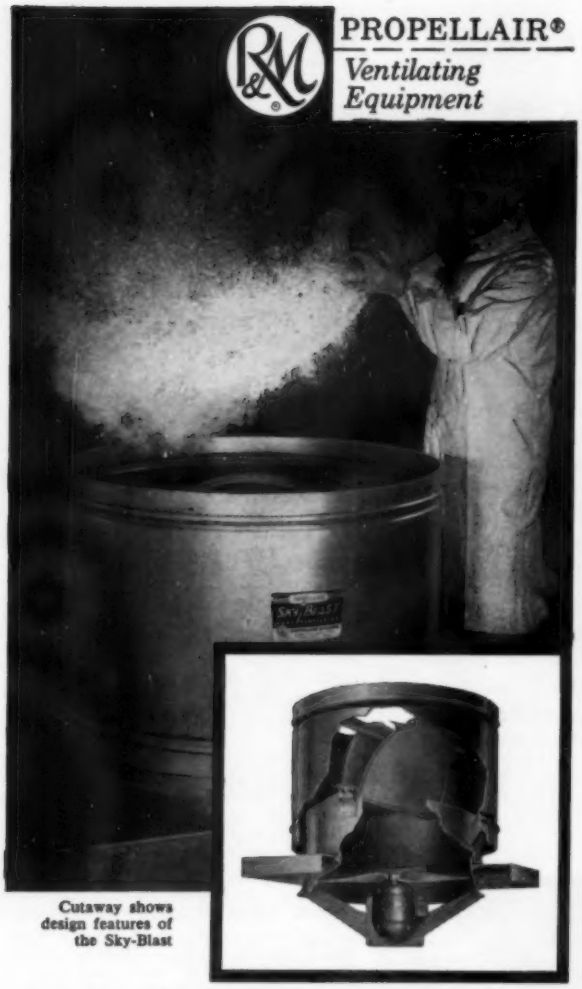

Cutaway shows design features of the Sky-Blast

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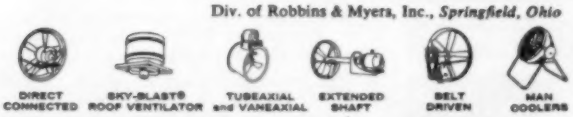

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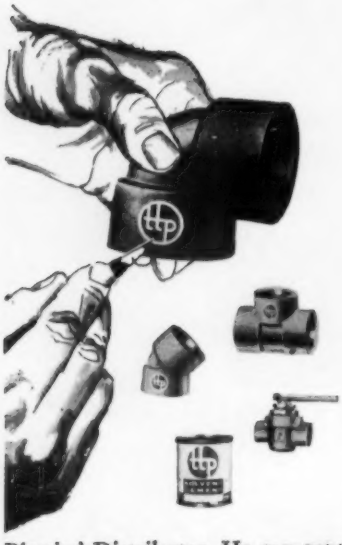

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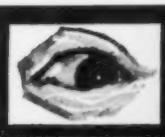

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DATA FILE

(Begins on page 282)

letin 2527-R. Covers use of electroforged grating in a wide range of industries also features grating applications in sidewalks, locks and dams, sewage treatment plants. Information provided includes types and spacing, bearing bar surfaces and weights, fastening methods, and safe loads. Blaw-Knox Co.

419 **Steel Grating**—Featured in 16-pp Bulletin 14R are company's steel grating and stair treads for a variety of industrial applications. Pictures of typical installations are included. Kerrigan Iron Works, Inc.

STORAGE, SHOP EQUIPMENT

420 **Guide to Shelving**—To assist plant engineers in selecting proper shelving for all storage requirements. 64-pp Catalog 30 offers detailed suggestions for correct shelving and storing materials, loose and packed parts, record files. Shop equipment and storage cabinets are also described and instructions included for planning of stockrooms. Deluxe Metal Products Co., Royal Metal Mfg. Co.

421 **Steel Equipment**—Catalog 100 H contains 92-pp of detailed information on steel cabinets, folding chairs, work benches, tool stands, shelving, tool storage, lockers, coat racks, filing cabinets, revolving bins, others. Includes dimensions and specification, as well as installation photos. Lyon Metal Products, Inc.

422 **Storage Racks**—Bulletin R-400, 12-pp, illustrates and describes a wide variety of storage racks manufactured by the company. Application drawings, photos and diagrams are included. Chicago Tramrail Corp.

MATERIALS HANDLING

423 **For Overhead Handling**—Illustrated and described in 20-pp Bulletin 15005 are Load Lifter cranes ranging from small capacity single girder crane bridges for use with hand operated chain blocks or electric hoists to large capacity double girder cranes with hand operated cable type hoists, including full revolving jib cranes. Specifications, capacities and dimensions included. Manning, Maxwell & Moore, Inc.

424 **Improved Hoist**—Complete information on five models of a new sealed ratchet lever hoist is provided in Bulletin ADH-78. Lists specifications and features of these hoists ranging from ¾- to 6-ton capacities. Coffing Hoist Div., Duff-Norton Co.

425 **Air Hoists, Cylinders**—Details on company's line of air hoists and cylinders for lifting, lowering, pushing, pulling, and opening or closing are presented in this Product Bulletin ABS-5. Engineering data table lists capacities. Curtis Mfg. Co.

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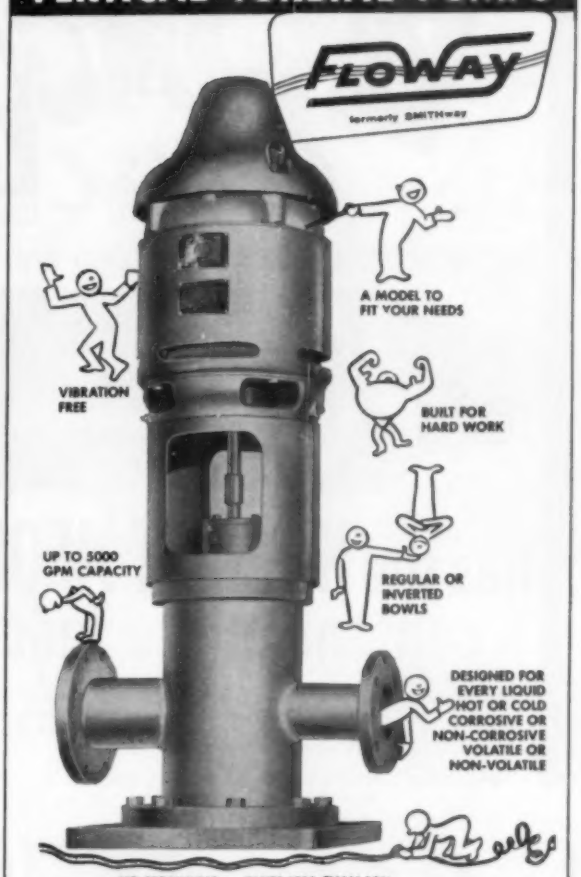
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DATA FILE

(Begins on page 282)

426 **Sheet and Coil-Lifters**—Bulletin SL-30, 16-pp, illustrates and describes various types of standard and semi-special lifters for one-man or automatic handling of sheet and coil stock. Advantages and design features are detailed and dimensions included. Cullen-Friestedt Co.

427 **Conveyor System**—Construction and operating features of company's power and free conveyor system for industry-wide application are illustrated and described in 6-pp Bulletin 159. Advantages are detailed and general specifications given. Columbus McKinnon Chain Corp.

428 **On Spiral Conveyors**—Described in 60-pp Catalog 951 are spiral conveyors and fittings for meeting practically any requirement and operating conditions. Four principal types—helicoid, sectional flight, ribbon flight, and cast iron—are listed along with special types. Selection tables list materials which can be effectively handled in a spiral conveyor, giving weights, loading classifications, characteristics and horsepower factors. Data on spiral feeders is provided. The Jeffrey Mfg. Co.

429 **Chain Conveyor**—Overhead chain conveyor systems are illustrated and described in 36-pp Catalog A-570. Includes information on track and chain, chain attachments, trolleys, vertical track curves, roller turns, traction wheel turns, take-up units, drive units, as well as engineering details, wiring diagrams, installation instructions, and chain pull calculation. Richards-Wilcox Mfg. Co.

430 **Conveyor Belt Carriers**—Illustrated and described in 20-pp Bulletin 355 is a line of carriers for conveyor belts designed for handling bulk materials. Carriers for a variety of different applications are featured, with dimensional data and specifications, and typical installations shown. Stephens-Adamson Mfg. Co.

431 **Self-Dumping Hopper**—Described in Bulletin 260 is a self-dumping hopper for low-cost handling of wet or dry, hot or cold, bulk materials. Roura Iron Inc.

432 **Industrial Casters**—Catalog 159 contains 24-pp of illustrations, descriptions and specification data on swivel-plate and rigid-plate truck casters for industrial applications. Includes detailed information on spring-action casters, V-grooved casters, grease-sealed casters, scaffold casters, floor truck locks, industrial wheels, and others. Faultless Caster Corp.

SLINGS, CHAINS, WIRE ROPE AND FITTINGS

433 **Sling Handbook**—Form SL-3 is an illustrated 40-pp reference book

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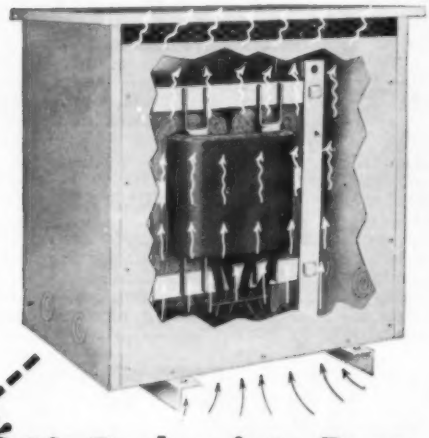

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DATA FILE

(Begins on page 282)

covering more than 80 subjects on slings and fittings. Included in this revised edition is reference information condensed into handy chart form on sling types, dimensions and rated loads. Union Wire Rope Corp.

434 Sling Chain Handbook—Illustrated Data Book 100. 32-pp, presents "how to do it" information on sling chains—from ordering to care, use and inspection. Contains diagrams, charts and tables on standard and special styles of the sling chains. Columbus McKinnon Chain Corp.

435 Wire Rope Selection Tips—This 16-pp illustrated booklet, "How To Be A Wire Rope Expert," describes basic principles governing selection of proper rope construction. Describes five factors to be considered and shows how these can be balanced for best possible efficiency regardless of application. Also illustrated is a device called the D/d ratio for determining best relationship of rope size to sheave or drum size. Leschen Wire Rope Div., H. K. Porter Co., Inc.

436 Drop Forged Fittings—Comprehensive data on company's line of drop forged fittings for wire rope and chain are presented in 40-pp Catalog 950-2. Includes specifications, dimensions, rated capacities and weights. Also announces range of sizes and capacities in many of items listed, as well as new products, including clips. Crosby-Laughlin Div., American Hoist and Derrick Co.

INSTRUMENTS, CONTROLS

437 Precision Instruments—Catalog G1 contains 32-pp of comprehensive information on indicating, recording and controlling instruments. Contains potentiometers, pyrometer supplies, descriptive and illustrative data on systems and components, null indicators, amplifiers and oscillographs, pressure gages, flow and liquid level meters, pneumatic remote transmission, thermometers, panelboards, valves, diaphragm motors, motor and dampers, switches, etc. Minneapolis-Honeywell Regulator Co.

438 Gages, Needle Valves—Catalog 76-G consists of a loose-leaf bound collection of literature on gages and needle valves. Various types of gages are illustrated and described, with applications and specifications fully detailed. Jas. P. Marsh Corp.

439 Indicating Flow Meters—This catalog combines all basic information on company's flow meters, flow switches, and manometers. Covers material composition of components, design characteristics, mounting methods, scales, maximum application temperatures and pressures, direction of flow, pipe connection locations, and other data necessary for installation and operation of flow meters. Seico Instrument Div., Eclipse Fuel Engineering Co.

440 Meters, Regulators, Valves—Bulletin C-5000, 28-pp, describes and illustrates meters, regulators and valves for a wide range of services. They include gas meters, gas pressure regulators, industrial meters, water meters. Information includes application suggestions, specifications and references to more detailed product literature. Rockwell Mfg. Co.

441 Oil Level Control—Circular 580 describes a line of constant level oil controls, bottle oilers, glass and aluminum body oil cups. Photos and cutaways illustrate construction and operating features. The Lunkenheimer Co.

442 Sound Measuring Equipment—Bulletin 797-E contains 16 pp of detailed information on a line of sound-measuring equipment, including sound-level meters, vibration meters, analyzers and accessories. Typical applications in a variety of industries shown. General Radio Co.

INSULATION

443 Insulating Material—Folder FS-1 contains information on Foamisil, a foamed silica material for insulation and refractory applications. A list outlining physical character-

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DATA FILE

(Begins on page 282)

istics of the materials, along with recommendations for its possible uses, is contained in folder, and sizes and shapes are illustrated. Pittsburgh Corning Corp.

444 **Duct Insulation**—Thermal and acoustical duct insulation made of long textile-type glass fiber is illustrated and described in this 8-pp Bulletin ULD-859. Includes detailed application specifications, data on characteristics of the duct liners, thermal efficiencies, sound absorption data. Gustin-Bacon Mfg. Co.

ELECTRICAL

445 **Single-Phase Motors**—Bulletin 470-B describes integral horsepower single-phase motors, ¾ to 20 hp, in open, protected, totally enclosed, fan-cooled and explosion proof frames. Bulletin outlines company's "weatherizing" treatment which makes motors suitable for use in damp, dirty or corrosive atmospheres. Tabulated ratings, dimensions included. Motor Div., Robbins & Myers, Inc.

446 **Distribution Transformers**—Dry type distribution transformers, single and three phase, are featured in 16-pp Bulletin 5A2-BL01. Wiring diagrams and detailed specifications are included, as well as nomenclature and descriptive information and illustrations of various units. Acme Electric Corp.

447 **Trolley Busway System**—Three bulletins offer help on electrical installations involving cranes and hoists, assembly and production lines, test lines and other moving electrical equipment. Bulletin 60, 40-pp, covers 60 amp systems; Bulletin 70, 32-pp, covers 225-500 amp systems; Bulletin 75, 44-pp, covers 100 amp systems. Each includes special section on installation planning and procedure, mounting. Feedrail Corp.

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448 **Power Panelboards**—Design and operation features of company's power panelboards with Vacu-Break arc control are illustrated and described in 18-pp Bulletin VBP-470. Circuit ratings are tabulated and layout procedure detailed, information on boxes, interiors, trims and doors included. Bulldog Electric Products Div., I-T-E Circuit Breaker Co.

449 **Enclosed Switches**—Catalog 83, 22-pp, Catalog 84, 16-pp, and Catalog 101, 24-pp, describe enclosed switches for industrial uses. Included are general switches designed for use on either a-c or d-c applications, sealed switches, heavy-duty limit switches, hand operated switches, and maintained-contact switches. Micro Switch, Div., Minneapolis-Honeywell Regulator Co.

450 **Safety Switch Design**—Advances in safety switch design are illustrated and described in this 28-pp Product Bulletin CPD-74. Features designed to increase safety, save in space, and provide for easy installation and long life are stressed. General Electric Co.

451 **Individually Enclosed Breakers**—Featured in 8-pp Bulletin 4261-2B are individually enclosed low-voltage power circuit breakers featuring visible break disconnect contacts. Selection chart, application data, and coil ratings are given. I-T-E Circuit Breaker Co.

452 **Molded Case Breakers**—Features and advantages of company's molded case circuit breakers are illustrated and described in 28-pp Bulletin GEA-6754. A cutaway view tells the inside story of circuit breaker design, and complete selection data, including section on determining ampere rating, is furnished. General Electric Co.

453 **Switch Wiring Diagrams**—Bulletin 709 is a 36-pp booklet of typical wiring diagrams for across-the-line starting switches. Indexed and arranged for easy use, this booklet

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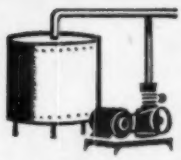

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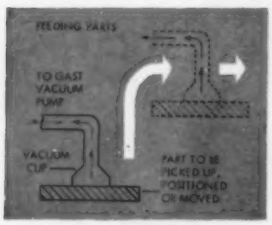

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DATA FILE

(Begins on page 282)

serves as a guide to some of the many ways in which this company's manual and magnetic across-the-line starters are used. Allen-Bradley Co.

454 Sheathed Cable—Construction details and performance data on company's sheathed cable, available in steel, copper, aluminum and bronze, are presented in 16-pp Bulletin 1031. Complete engineering data, installation and application information, test results and dimensional data included. Simplex Wire and Cable Co.

455 Rubber Power Cable—This 32-pp catalog contains detailed information on design features, insulations, and performance highlights of butyl rubber power cable. Includes data on available constructions, ampacity and installation data. Anaconda Wire & Cable Co.

456 Armored Cable—Advantages, characteristics and construction of interlocked armored cable are detailed in Bulletin VC-2-Rev.59. Types of insulation are described and illustrated. General Cable Corp.

457 Rubber-Jacketed Cord—Illustrated and described in this product bulletin is a line of rubber jacketed portable electrical cord. Construction details and advantages are covered. Western Insulated Wire Co.

458 Battery Technology—Bulletin GB-1896 is a 36-pp handbook of technical instructions and engineering data on the care of motive power storage batteries. Covers all phases of lead acid battery theory, operation and maintenance. Captioned line drawings are included, as well as basic information on specific gravity changes, charging and discharging cycles, plate composition. Gould-National Batteries, Inc.

459 Electrical Equipment Digest—Electrical equipment illustrated and described in 160-pp Catalog Digest 142, includes load centers, circuit breakers, low voltage control, fusible service equipment and accessories, meter sockets and troughs, safety switches, panelboards, duct and fittings, starters. Square D Co.

460 Portable Test Sets—Featured in 8-pp Bulletin SB-OCR-1 are portable test sets for oil circuit reclosers. Operation details of the test sets are given, as well as specifications and overload capacity curves. Multi-Amp Div., Multi-Amp Electronic Corp.

461 Testing Instruments—This 16-pp booklet features company's electrical testing instruments, including ohmmeters, ground testers, dielectric test sets, motor rotation tester, cable fault locating equipment, transformer turn ratio test sets, corona test equipment, frequency meters, tachometers, others. Includes photos and descriptions of each type, including chief features. James G. Biddle Co.

462 Renewable Fuses—The first section of 12-pp Bulletin 1320, discusses construction and application features of two types of renewable fuses—ferrule and knife-blade—as well as renewal links to facilitate replacement. Salient features are highlighted by sectional and cutaway drawings. Ordering information and specifications of the 250-v and 600-v fuses are covered in the second section. Federal Pacific Electric Co

463 Surface Metal Raceways—Eight-pp Form 607 describes features and advantages of company's surface metal raceways and multi-outlet systems. A variety of typical applications are illustrated, and capacity data given. The Wiremold Co.

LIGHTING

464 Industrial Lighting Data—New specifications for incandescent and mercury vapor uplight porcelain enamel and aluminum high mounting units, "all-white" incandescent specs and many upward revisions in specifications for industrial fluorescent fixtures are included in 44-pp current RLM Specifications Book. Contains complete specifications for 14 basic types of most widely specified industrial lighting units. RLM Standards Institute, Inc.

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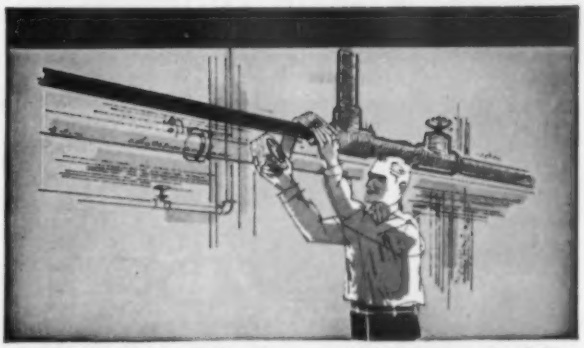

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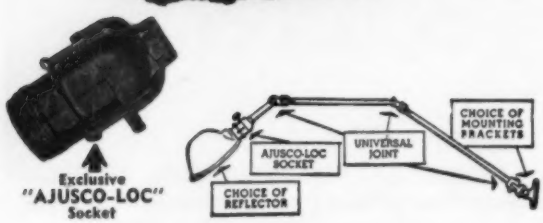

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DATA FILE

(Begins on page 282)

465 Lighting Units—Design and performance advantages of Wide-Lite units for use with color-corrected mercury vapor lamps are detailed in this product Bulletin 405. Typical candlepower distribution curves are included. Wide-Lite Corp.

466 Precision Lighting—Twelve-pp Catalog 66 contains detailed information on company's line of industrial precision lighting fixtures. Photos, drawings, and dimensional diagrams are included, as well as other data. Adjustable Fixture Co.

467 Incandescent Lighting—The 24-pp "Incandescent Lighting Guide Book" features sections on the general advantages of incandescent lighting, the history of incandescent lamp developments, and includes chapter on basic types, bulb shapes, sizes, glass types and finishes, and bases. Sylvania Electric Products Inc.

468 Emergency Lighting—Twenty-pp Publication 243A features emergency lighting systems for commercial, industrial and other types of buildings. In addition to describing the systems, catalog contains complete information and specifications on all components. The Standard Electric Time Co.

469 Cold-Coded Fixtures—Described in 8-pp File 4 is a line of color-coded industrial lighting fixtures designed to direct and protect workers. Includes photos, lighting data, engineering information and data on luminaries and reflector units. The Edwin F. Guth Co.

470 Lamp Data—Incandescent and fluorescent lamps are featured in this 16-pp bulletin. Selection tables list complete descriptive and electrical details. Champion Lamp Works.

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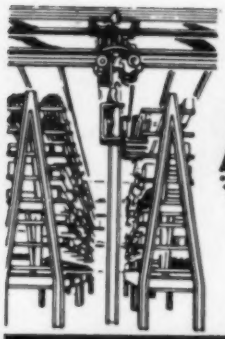

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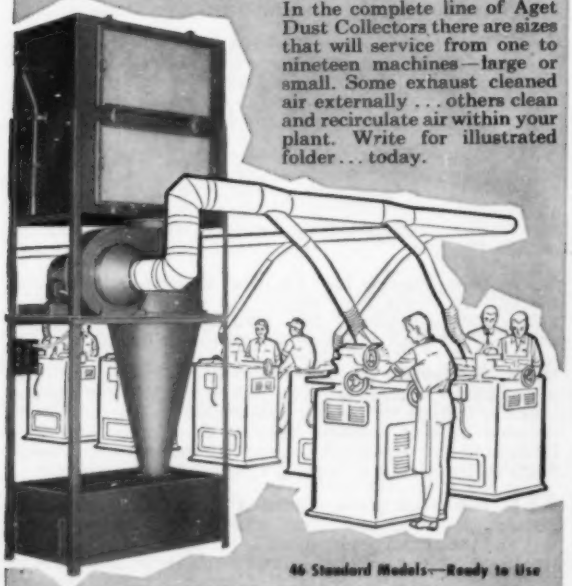

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DATA FILE

(Begins on page 282)

471 **Area Floodlighting**—Planning for lighting of parking areas, construction sites, other open areas is detailed in 16-pp Bulletin 2719. Contains reference guides for selecting incandescent or mercury floodlights, general purpose or heavy duty types, and for determining how many floodlights are needed based on size of area to be lighted, as well as footcandle charts. Crouse-Hinds Co.

FENCING

472 **Chain Link Fence**—Catalog F-915, 64-pp, contains illustrated information on company's line of chain link fences of aluminum or steel for a variety of industrial, commercial and other applications. Detailed specifications and dimensional data are included, also photos of installations. The Colorado Fuel and Iron Corp.

473 **Aluminum Fencing**—A comprehensive review of aluminum's role in the growing fence market today is presented in this 12-pp booklet. Outlines details of typical installations of aluminum chain link fence. Complete technical data on strength, resistance to corrosion, and durability is presented. Aluminum Co. of America.

OTHER EQUIPMENT

474 **Classifying Systems**—This bulletin covers major advantages, industrial applications and design features of high efficiency classifying systems for efficient separation or dedusting of dry powdered materials. Includes details on operation, flexibility or arrangement, power requirements, construction. Buell Engineering Co., Inc.

475 **Water-Cooled Stoker**—Design and operating advantages of the Vibra-grate Stoker are outlined in this illustrated bulletin. A large cutaway view details component parts of the stoker. American Engineering Co.

476 **Paint Finishing**—Six articles on factors to consider when planning a paint finishing system are contained in this 24-pp reprint. They cover conveying systems, layout, equipment for metal preparation, ovens, methods of paint application, and auxiliary equipment. Many photos are included, also line drawings illustrating a typical layout and giving details of five stages of metal cleaning, etc. J. O. Ross Engineering Div., Midland-Ross Corp.

477 **Rotary Air Motors**—Catalog 859, 8-pp, describes a line of rotary air motors, compressors, and vacuum pumps designed to give continuous air motor power or delivery. Includes dimensional diagrams, speed-hp-air consumption curves, pressure and vacuum curves. Gast Mfg. Corp.

478 **Cyclone Separators**—Featured in 8-pp Bulletin 712 are company's cyclone separators and pipe line aftercoolers designed to provide cool, dry and clean compressed air and gases. Cutaway views illustrate component parts and features, and capacity tables facilitate selection. R. P. Adams Co., Inc.

479 **Drain, Supply Line Cleaner**—Described in Bulletin 658Du is a drain and supply line cleaner featuring a lightweight aluminum alloy housing. Features and advantages are illustrated and described. Kollmann Mfg. Co.

480 **Hydraulic Press Brakes**—Features and applications of company's hydraulic press brakes designed for jobbing shops as well as for many mass-production operations are detailed in 8-pp Bulletin 2024-B. Component parts are illustrated and described, clearance dimensions and specifications listed. The Cleveland Crane & Engineering Co.

481 **Industrial Stack**—Detailed information on a permanent, low cost refractory smoke stack for commercial and industrial applications is contained in 8-pp Bulletin IS-32. Gives product information, applications with boilers, etc. Van-Packer Co., Div., The Flintkote Company.

482 **Automatic Air Products**—Featured in 22-pp Bulletin 157 are automatic air products, including separators, afterdriers, filterators, filters, line drains, governors and

kits, combinations, regulators, and lubricators. Advantages are detailed and operation described. Wilkerson Corp.

483 **Production Control System**—Versatility of company's visible record systems in production control is illustrated and described in this 12-pp Bulletin SB-66. How various types of visible record forms guide decisions—from sales records and market analysis, through engineering design, purchasing, cost, tool and die, shop parts and materials stores, production and scheduling—is pictorially presented. Acme Visible Record, Inc.

484 **Industrial Cooling Towers**—Design and construction features of company's industrial cooling towers utilizing the cross-flow principle are detailed in Bulletin G-60. Also described are double-flow aquatowers, and other equipment. The Marley Co.

485 **Elastomer Coated Fabrics**—Detailed information on synthetic elastomer coated fabrics is presented in this 12-pp bulletin. Physical properties and tests of the various synthetic fabrics, applications and specifications are covered. E. I. du Pont de Nemours & Co., Inc.

486 **TV at Work**—This 8-pp brochure, "How Many Jobs," covers an extensive line of industrial television equipment. Shows cameras, control units, monitors, accessories, and projection systems. Varied applications, including installations with unusual engineering requirements are pictured. General Precision Laboratory.

487 **Pneumatic Products**—Catalog 616E contains 22-pp of comprehensive information on company's pneumatic products, including filters, regulators, lubricators, combination units, air relief valves, air strainers and accessories. Specifications are given, as well as curves showing performance characteristics. Watts Regulator Co.

488 **Corrosion Resistant Products**—Featured in this 8-pp bulletin are resin bonded fiber glass products for the chemical industry, including ducts, stacks, hoods, fans, tanks, trays, ejectors, hoppers and covers. Typical applications are illustrated. du Verre Inc.

489 **Templet Guide**—Listed and described in this 102-pp catalog are over 15,000 templets representing the most-used standard machine-tools and shop equipment items. Covers templets for machines, shop equipment, material handling equipment, lab equipment, office equipment, and architectural details and includes complete price and dimensional information. Catalog is available to qualified plant engineers, please state your job title when requesting it. Repro-Templets Inc.

490 **Compressed Air Dryer**—Featured in 12-pp Catalog D2-858NE5 is a dryer designed to provide dry, clean, safe compressed air for a variety of industrial uses. Describes features and operation, and includes dewpoint graphs, operating capacities. Van Products Co.

491 **Hinged Closures**—One-man hinged closures with built-in safety features for vacuum, low and high pressure service are described in this product bulletin. Photos illustrate features, charts give dimensional specifications and cross-section drawings show design details. Tube Turns Div., Chemetron Corp.

492 **Fluid Mixers**—Advantages and mechanical features of company's industrial mixers designed for a variety of fluid mixing operations are detailed in a series of bulletins available in this ring-bound notebook, containing Bulletins B-102, 103, 104, 108 and 111. Selection tables, outline dimensions and photos of typical applications are included, as well as specifications, mixer capacity tables, photos. Mixing Equipment Co., Inc.

493 **On Gasket Leakage**—Technical Paper 139, entitled "Some Causes of Boiler Gasket Leakage" provides some little known facts to help minimize a common, annoying problem. Betz Laboratories, Inc.

494 **Filter Media Selection**—Twelve-pp Bulletin PUR-66D contains a chart designed to guide selection of proper engineering materials and filter media for given types of corrosive conditions. The chart lists filter media for varying concentrations of more than 25 corrosive agents. Purolator Products, Inc.

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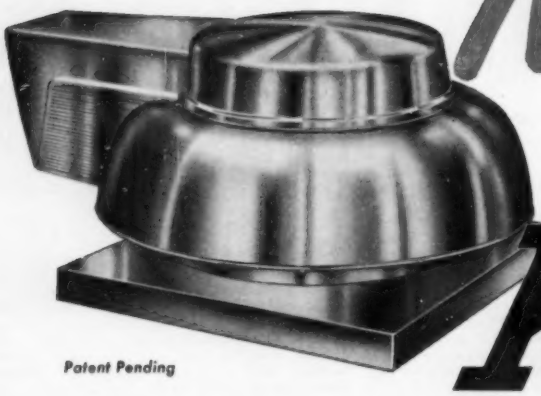

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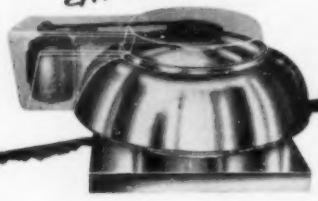

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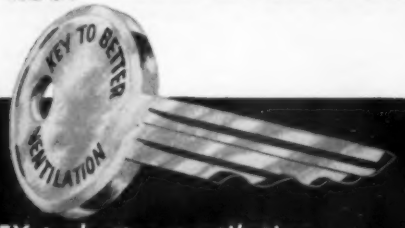

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- Maintenance-free all-aluminum housing provides strength without weight.
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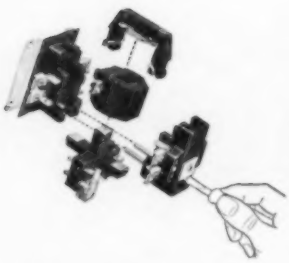

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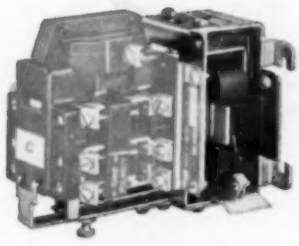
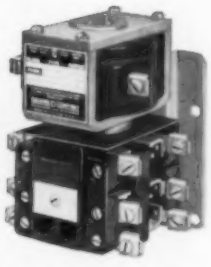


Convert any Square D Type D relay to mechanically held with easy-to-use attachment



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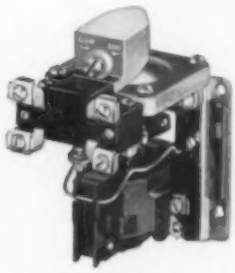

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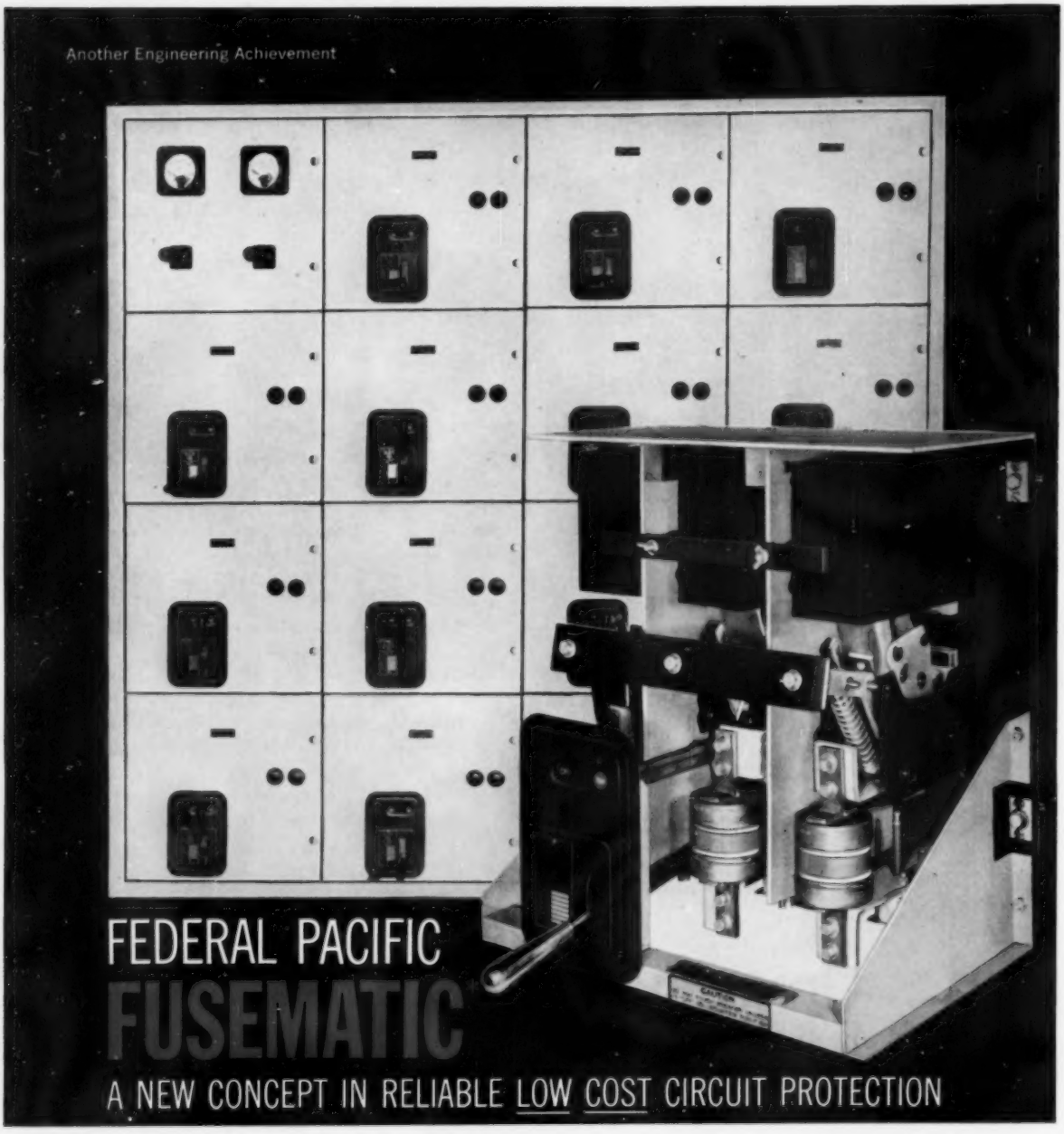

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